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BULLETIN

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CONTENTS.

	PAGE
Major James Carroll, M. D., U. S. A. Addresses by Drs. H. A. Kelly; W. H. Welch; W. S. Thayer; Surg.-Gen. Sternberg, U. S. A.; H. H. Donnally; A. F. A. King; S. Ruffin; C. E. Munroe; and J. O. Skinner.	1
The Maternal Mortality in the First 5000 Obstetrical Cases at the Johns Hopkins Hospital. By Francis C. Goldsborough, M. D.	12
Notes on New Books.	20
Notes and News.	24
Books Received.	26

MAJOR JAMES CARROLL, M. D., U. S. A.[1]

Addresses by Drs. H. A. Kelly; W. H. Welch; W. S. Thayer; Surg.-Gen. Sternberg, U. S. A.; H. H. Donnally; A. F. A. King; S. Ruffin; C. E. Munroe; and J. O. Skinner.

Dr. Kelly:

The late James Carroll was an Englishman, born at Woolwich on June 5, 1854. He received a good school education, and it was intended that he should enter the navy as an engineer student. At the age of fifteen, however, when still at a private school, he emigrated to Canada, in consequence, as he once told me, of a disappointment in a youthful love affair. For some years after he reached Canada, to use his own expression, he "roughed it in the backwoods." I do not know when, or for what reasons he crossed the line and came into the United States, but in 1874, when he was twenty years old, he entered the U. S. Army as a private soldier; or, to use his own words again, he "drifted into the army."

After Carroll enlisted, he was ordered to the far West (Dakota and Fort Custer, Montana) and while serving there as hospital steward he became interested in the study of medicine. He applied for a detail in order to attend medical lectures at St. Paul, Minn., but the application was refused, on the ground that his education would lead to his leaving the service. Subsequently, however, he obtained the necessary permission, and from that time he continued his medical education as best he could and how he could, availing himself of every opportunity for acquiring the necessary knowledge. Finally, on his return to the East, he attended medical lectures at the University of the City of New York in 1886-1887, and at the University of Maryland in 1889-1890 and 1890-1891, receiving his degree of M. D. from the latter institution in 1891.

Carroll became intensely interested in the new science of bacteriology, then just beginning to offer its magnificent promise for the future of medicine, and during the winters of 1891-2 and 1892-3 he worked in the classes in bacteriology and pathology recently opened for physicians and graduate students at the Johns Hopkins Hospital. At that time a coterie of brilliant men were assembled there, drawing daily inspiration from William Welch, among whom were Walter Reed, Councilman, Barker, Abbott, Lafleur, and Gilchrist. It is probable that Reed and Carroll met frequently, although their first direct and close association was in 1895, when Carroll was assigned to duty in the Army Medical Museum at Washington, where Reed was curator. The tastes of these two in scientific work ran in the same lines, and Carroll assisted Reed in the search for Pfeiffer's supposed parasite in the blood of vaccinated calves, children, and monkeys, as well as in other work done at the Columbian University.

In 1899 Reed and Carroll were appointed by Surgeon-General Sternberg to investigate the true nature of the *bacillus icteroides,* which Sanarelli erroneously supposed was the specific agent in yellow fever. Their work on this subject naturally associated them with the study of the yellow fever problem at large, and when, in 1900, an Army Medical Commission was appointed to go to Cuba to investigate the cause and mode of the transmission of the disease, Reed was made chairman and Carroll was placed second in command.

[1] The first nine papers in this number were read at the Johns Hopkins Historical Club Meeting, October 14, 1907, held in memory of Major James Carroll, M. D., U. S. A.

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Carroll sailed with Reed from New York on June 21, 1900, reaching Havana on the 25th instant. Certain facts which came under their observation immediately after their arrival convinced Reed that the most promising line of investigation was that suggested some years before (1881) by Dr. Carlos Finlay, namely, to attempt to discover whether or not the infection of yellow fever was conveyed from patient to patient by means of a particular species of mosquito, also pointed out by Finlay, the *stegomyia fasciata.* Acting upon this idea which was, in reality, generally believed to have been discredited by Finlay's own experiments, Reed outlined a masterly plan of action which was heartily approved by his colleagues. The line of work as planned could not be carried out, however, without some crucial experiments upon human beings, and the members of the Commission, to their everlasting credit and honor be it said, further agreed that it would not be right to allow any outsider to risk his life until they were satisfied from an experiment upon one of themselves that the theory which they sought to test offered some reasonable prospect of successful demonstration. It was Carroll who volunteered, if necessary, to sacrifice his life in this service.

It became necessary just at this juncture for Reed to return to the United States, while Carroll remained in charge of the work at Quemados near Havana. It was on the twenty-seventh day of August, in the year 1900, that Dr. Lazear applied an infected mosquito, that is to say a mosquito which had bitten a yellow fever patient twelve days before, to Carroll's arm. I have been told by Carroll that although he heartily approved of the wisdom of investigating Finlay's theory, he did not himself strongly believe in it, so that on the night after the inoculation he wrote to Dr. Reed half in jest that if there were any truth in the mosquito theory, he ought to have a good dose of the poison. And so the event proved it to be, for on August 31, three and a half days later, he was smitten down with such a severe attack of yellow fever that for some days life itself was despaired of. During the course of this illness a serious complication arose in the form of an acute dilatation of the heart which laid the foundation of the permanent heart lesion which ultimately (seven years later) caused his death.

He described the advent of this untoward and finally fatal complication in the following language:

> Within half an hour of the removal of a hot mustard foot bath, and while I was oppressed with a weight of heavy gray blankets, I felt a sudden pain and embarrassment at the heart. The pain was very acute and accompanied by a feeling of distention as if the organ was much distended in diastole. Happily it only lasted a few moments. This was the only time I felt myself to be in imminent danger.

During Carroll's convalescence a little incident occurred which gave him a good deal of amusement. One of his nurses, who came from Tennessee, had had considerable experience with yellow fever, having, indeed, lost a husband and several children from it. One day, early in his illness, Carroll mentioned to her that he had contracted the disease through the bite of a mosquito, and noticed that she looked surprised. Some time later, when he was well enough to inspect the daily records of his condition, he found this entry, "Says he got his illness through the bite of a mosquito—*delirious.*"

It would seem to most men that an attack of yellow fever, voluntarily acquired, was a sufficient excuse for relief from further labors in this field, for some little time at least. But Carroll was not of this fiber—no sooner was he able to be up and about than he set to work to carry on further researches along the lines planned by the Commission, and in which he was so successful that when Dr. Reed returned, early in October, he found the preliminary experiments completely finished and the material for his report upon them ready for him. This report was made in the name of the Commission by Dr. Reed in person, at the end of October, 1900, before the American Health Association meeting in Indianapolis, Indiana.

In November, Reed was once more in Cuba superintending the formation of Camp Lazear and the carrying out of the experiments which established upon an irrefragible basis the fact that yellow fever is transmitted by the *stegomyia fasciata,* and by it alone, or to name the pest according to the new nomenclature, the *stegomyia calopus.* In February, 1901, when the work at Camp Lazear was finished, Reed returned to the United States, while Carroll remained behind at Quemados to investigate certain points concerning the urine in yellow fever, as well as to ascertain how long an infected mosquito was capable of carrying and conveying the infection. In March, upon the completion of this branch of the work, Carroll went home, but in the following August (1901) he is again in Cuba, having returned to make some experiments by which he proposed to determine whether the specific agent in yellow fever was contained in the blood, as well as to settle some associated problems. It is not too much to say that without these experiments of Carroll's the inoculation theory would have remained incomplete, and its usefulness to humanity would have been less assured. Yet their importance has never, perhaps, been sufficiently appreciated by the medical profession, and certainly not by the world at large. Nor has it been clearly understood how entirely the successful accomplishment of this final division of the work was due to Carroll's clear-headedness and determination to overcome all obstacles.

In the hospital of Las Animas at Havana, where Carroll was to work, Dr. John Guitéras had some time before undertaken experiments with the intention of ascertaining whether the propagation of yellow fever in a controllable form would secure immunization among the newly arrived immigrants. Up to the time of Carroll's appearance, however, no case of experimental yellow fever had been produced, in spite of numerous attempts, and the physicians at the hospital were naturally beginning to feel discouraged. Immediately after Carroll's arrival, however, an experimental case did develop, concerning which Carroll wrote to Reed as follows:

> August 13, 1901.
>
> Drs. Finlay, Gorgas, and Guitéras were much put out over their failures, but now they are all very much elated. On the evening of my arrival the first case came down, and on the following day

another man. . . . I am making preparations to draw blood from one of these individuals to-morrow.

Dr. Carroll had been sent to Las Animas by the United States Government for the express purpose of carrying on this work, for which the abstraction of small quantities of blood from yellow fever patients was the most essential step, and he had come with the confidence that every facility would be afforded him. His surprise was great therefore, when, on going to draw the blood from the patient in question, permission was refused, for reasons which he states in his letter to Dr. Reed, written two days after the one cited above.

August 15, 1901.

I have to record my first disappointment. When I last wrote you I was making preparations to draw blood from Dr. Guitéras' second case. It was a good one with a constant temperature ranging between 103° and 104° F., and I expected to draw blood from him yesterday. Early in the morning Dr. Guitéras advised against it, for the reason that the moral effect upon the man might be bad. He admitted that the man's general condition at that time was good, but he interposed the objection that the man was bitten for another purpose and that his promise to him did not include any such operation. The matter was decided by Major Ross, who has charge of the treatment of the cases, and who, of course, sided with Guitéras. You can imagine my disappointment.[2]

The situation was a trying one, but Carroll, nothing daunted, determined to secure an experimental case of his own with which no authority could interfere. This plan, retarded the work considerably, as it was necessary first to obtain the means of remunerating the man who might volunteer for the inoculation; he had next to find the volunteer; and, lastly, to wait until he had been infected, developed the fever, and had had it long enough to reach the stage when the blood might be drawn and used to advantage. The money was obtained from the United States government, and volunteers, for the most part from the United States Army, were always forthcoming, but just here another and a puzzling difficulty presented itself, namely that the inoculation often failed, because the patient had already had the fever, but if no one but himself was aware of the fact, he could in this way transact a little profitable business with the paternal government without any prospect of a charge of duplicity being lodged against him.

A suitable case was at last found, but then Carroll found himself confronted with still further unforeseen difficulties. While he was preparing to proceed with his experiments, two fatal cases of experimental yellow fever unfortunately developed among Dr. Guitéras' patients, and this not only alarmed Dr. Guitéras and Dr. Finlay, but created considerable excitement in the public mind. Dr. Reed, disturbed by the exaggerated reports of public feeling which reached him through the press, and hampered in his judgment by the disadvantage of being at a distance, wrote advising against further experiments of this sort. "This leads me," he wrote, "to advise strongly against further experiments on human beings. Our work has been too good to be marred now by a death. As much as I should like to know whether the filtrate will convey the disease I should advise against it." Carroll, however, had no intention of being driven from the field just as the crowning success of these final investigations was at hand, and his correspondence with Reed at this delicate juncture shows that the completion of their labors was due to his ability to decide for himself with the facts before his eyes, without being influenced by adverse surrounding conditions or criticisms. He had the wisdom to rely with modest confidence upon his own trained judgment, even when it differed from that of his superior officer, upon a point in regard to which the superior was imperfectly informed. A most delicate situation, indeed, and we must judge rather by its issue than upon the broad basis of the principle involved.

In all the inoculation experiments at Camp Lazear, as intimated above, there had been no fatal case of yellow fever, and Carroll was convinced that it was quite possible to complete the investigations without really unjustifiable risk to life, as the deaths at Las Animas were due, in his opinion, to special causes which it was well within his power to control in the cases under his personal supervision. Accordingly he proceeded calmly with his preparations, writing to Dr. Reed that as long as he did not expressly forbid further the investigations he thought it right to continue them. Dr. Reed's confidence in Carroll's opinion is shown by the fact that on receipt of the letter above referred to, he at once withdrew his objections and telegraphed to Carroll to proceed according to his own judgment. This episode, I think, reflects high credit upon Dr. Reed's character, for few men are so lacking in official pride as to be able quickly to reverse a positively expressed opinion, particularly when an implied order has gone forth to a subordinate.

Even when the completion of his task was close at hand, Carroll had to encounter yet another and a peculiarly trying

[2] The following note is appended by Major Ross:

"Having recently arrived (his third visit to Havana) Dr. Carroll evidently did not understand the status of the personnel of Las Animas Hospital. I was the director of said hospital, while Dr. Guitéras was the chief of its laboratory, which included the mosquito work—'Inoculation Station.' Consequently, I, and not Dr. Guitéras, was responsible for Dr. Carroll's difficulties in getting blood from the patients at Las Animas. It happened that the group of yellow-fever cases which we had there at the time were exceptionally severe ones. I explained to Dr. Carroll that each of these patients was too ill to safely undergo the excitement and fright (not to speak of the depletion) incident to the abstraction of several ounces of his blood, as proposed. I consulted Dr. Guitéras, on account of his immense experience and extensive knowledge of yellow fever. He entirely concurred in my opinion. That it is peculiarly dangerous to subject seriously-ill yellow-fever patients to the slightest shock or disturbance has long been known.

"The vitally important facts that yellow fever is transmitted to man by the mosquito, and by inoculation of blood directly from yellow-fever patients, as well as the impossibility of transmitting it by fomites, had already been conclusively demonstrated.

"If Dr. Carroll had been in my place, and with my responsibility, I believe he would have acted as I did.

"JOHN W. ROSS,
"Medical Director U. S. Navy, Retired."

set-baek arising from an act of offieious disobedience on the part of an assistant. The final experiment in the investigation was to be made with serum passed through a Berkefeld filter by means of a force pump. This pump which had been brought by Carroll from New York, was tested by him on the very morning of the day it was to be used, and then put earefully away in a closet, to which no one else had access but his assistant. About seven o'elock in the evening, Carroll began his work, but no sooner had he made a few strokes with the pump than the filter was forced out of the flask, fell to the floor and broke, losing all the serum. On looking for the explanation of the mishap, it was found that the valve attachment of the pump had been reversed so that a positive instead of a negative pressure was obtained, with the result described. No one but the assistant had aceess to the closet in whieh the pump was kept, and this fact, together with others, left no doubt that this servant had taken the pump out to display it to visitors and reversed the valve in an over-weening eonfidence in his knowledge of its workings.

The letter in which Carroll described this ineident to Reed was given me by Carroll for publication, but, when, on looking over the manuscript, he found that the delinquent's name was mentioned, he asked permission to erase it, saying that if there was any possibility of its doing the man an injury, he would not like to have it on his conscience.

In spite of all these vexatious hindranees the great work was at last eompleted. The experiments made during this last visit of Carroll's to Cuba established: (1) that the speeific agent of yellow fever is present in the blood during at least the first, second, and third days of the disease; (2) that the specifie agent is destroyed, or at any rate attenuated, by heating up to 55° C. for ten minutes; (3) that yellow fever ean be produced by the injeetion of a small quantity of diluted serum taken directly from a patient and passed through a Berkefeld filter; and, finally (4) that as the specifie germ is capable of passing through a Berkefeld filter, it must belong to that mysterious class of organisms, known as *ultra-microscopic*. It is only necessary to review these points to reeognize their importance as additions indispensably necessary to eomplete our knowledge of the natural history of yellow fever. I eall attention to them here in order to emphasize the faet that their establishment at that particular time is due, not only to Carroll's scientifie knowledge and enthusiasm, but to his elearness of judgment and his determination not to be defeated in his purpose, no matter what obstaeles lay in the way of fulfilment. No one has, as yet, seemed to appreciate how mueh we owe to Carroll in the completion of the last stages of this momentous work.

The report of these experiments was the final publication issued in the name of the Yellow Fever Commission, the members of which were now Reed and Carroll only. Dr. Carroll eontinued, however, from his home in the United States to disseminate the valuable information he had acquired, through the medium of a number of seientific papers, issued from time to time. The first of these on the "Treatment of Yellow Fever," which appeared in the *Journal* of the American Medieal Association for July 19, 1902, was the first communication of any moment on the treatment of the disease since its mode of transmission had become known. It conveys a great deal of valuable information on the therapeutics of yellow fever. This article was followed by others appearing in periodicals at intervals up to about eighteen months ago, when the last appeared, entitled "Without Mosquitoes there ean be no Yellow Fever," in *American Medicine* for Mareh, 1906. The final contribution to the subject from Carroll's pen is the seetion on "Yellow Fever" in the second volume of Osler's "System of Medieine."

In regard to these publieations I should like to mention a little incident which, I think, shows how truly retiring and modest was Carroll's disposition. When the Life of Walter Reed was in preparation, I wrote and asked him if he could send me any publications giving me general information as to the work of the Commission; in reply he sent me the reprints issued by the Commission, which were prepared by Reed as chairman. I then wrote again, asking whether he himself had not written upon the subject, when he sent me such of his own papers as had up to that time appeared. He made no allusion to them, however, until I made a direct inquiry. How many of us would have shown a like restraint?

Carroll says in a personal letter that the eircumstances in his life of whieh he was espeeially proud was the fact that he was the first person to succumb to an attack of experimental yellow fever. He might justifiably have prided himself on the faet that he was the first person to volunteer for the experiment, but that way of looking at the matter would never have entered Carroll's mind.

Carroll's life, although he was English born, was typically American; of that dramatic order whieh is so often epitomized in the expression "from the tow-path to the White House." He was unconquered by the obstacles so thickly strewn in his path, and ever showed a persistenee, whieh, if not a necessary element of genius, is at least an essential part of that most exeellent quality whieh is its closest ally and may pardonably be mistaken for it.

Carroll, who has become one of our national heroes, in the brief span of thirty-three years rose from the dull level of the ranks of the army to unusual distinetion as a scientist, with the title of major, and was one of the now immortal trio whose labors have conferred upon their country the most signal benefits which have ever yet accrued from any discovery or invention made within its borders. Great gains are often the fruits of the lavish outlay of wealth and time, with the eonjoint labors of many of our countrymen, as in the case of the present Panama canal, but these heroes have eonferred upon all men a boon of inestimable value, with but an insignificant outlay of money.

This great work, whose value it were invidious to estimate by money standards, has been done by these three men and by them alone, without any great expenditure of time, and has been handed over in a form so simple that a ehild, with a few

minutes' instruction, can at once reap its fullest benefits. Best of all, I think, is the fact that they were content with the virtue which is its own reward and sought no large emoluments nor posed as mighty heroes.

Lazear, Reed, Carroll, naming them in the order in which we have seen them leave us, by their joint labors, and with that simplicity which is ever the mark of the greatest work, have already saved our country countless lives, as well as millions in money, and in the foolish destruction of valuable property in misdirected efforts to check the march of the disease. The fabled burning of villages in China in order to gratify the craving for roast pig was the quintessence of wisdom as compared with the folly of burning up of clothing, bedding, and furniture, or the driving great steam screws into bales of rags in order to drive out yellow fever.

May we not also in our brief inventory of the signal blessings received at the hands of our heroes, include the release of the mind from the terrible apprehensions of an insidious, swift, and awful death, as well as from the brutal conduct often engendered by an epidemic of yellow fever, so vividly described by Carey, Rush, and Keating. This is the language with which several of the most distinguished men whom we have ever known in the ranks of our profession conclude a report made one hundred and ten years ago (see *Medical Repository,* 1797, vol. 1, p. 411).

Philadelphia, November 6, 1797.

In thus urging in regard to the domestic sources of the Yellow Fever, we are actuated by motives of magnitude far beyond those which determine ordinary questions of science. Though we feel the strongest conviction that the value of property, the increase of commerce, and the general prosperity of our city, will be eminently forwarded by the adoption of the foregoing propositions, yet these are but little objects in our view, when compared with the prevention of the immense mass of distress which never fails to accompany a mortal epidemic. We consider ourselves, moreover, as deciding upon a question which is to affect the lives and happiness, not only of the present inhabitants of Philadelphia, but of millions yet unborn in every part of the globe.

We are, with the greatest respect, Sir,

Your very humble servants,

BENJAMIN RUSH,
CHARLES CALDWELL,
WILLIAM DEWEES,
JOHN REDMAN COXE,
PHILIP SYNG PHYSICK, et al.

As in the middle ages, so in our own land, pandemonium and hell were let loose and held high carnival, with profligate industry robbing and murdering the sick and the dying, until in their orgies of lust the ghouls of the epidemic, in their turn, fell victims to the impartial scourge.

I cannot help reflecting, as I think upon the admirable simplicity of the results of the work of James Carroll and his colleagues, that it would have been appreciated more by their countrymen had it been necessary, in order to reap its benefits at each threatened epidemic, to post at intervals throughout our cities some great and costly engine emitting lurid sulphurous flames, casting a vast pall of offensive smoke over the protected neighborhood, and accompanied at frequent intervals by fearful, thunderous, nerve-racking detonations. Doubtless our cities would then vie with one another in their eagerness to erect monuments to the men who had succeeded in expelling so dreadful a disease in such an appalling manner, so satisfying to the supersaturated dramatic cravings of our theatre-going population.

I look abroad, by way of comparison, and ask what other lands are doing to honor their benefactors, and I see the inventor of a serum used to test the presence of tuberculosis compounding his nostrum in profound secrecy; I see another compounding a diphtheria serum and impudently seeking to patent his claims in foreign countries while reaping a rich harvest of gold by his patents at home, thus ghoulishly feeding on the sick and dying. Yet both are richly rewarded and honored by their own countrymen. I turn my expectant eyes homeward and behold the three men who have completed a task of equal magnitude; one of them lays down his life, and the others quietly retire from the field amply rewarded by the consciousness that they have been permitted to serve their day and generation by stamping out a dreaded pestilence.

Carroll had the elements of success within him from the first, he was the typical *vir tenax propositi;* with innate power and rare skill and tact he discerned and delicately followed those clues which led him from the subaltern ranks of the army to the laboratory. Carroll's clues were those which present themselves to each one of us, beckoning us into new avenues and wider walks with better vistas daily presented but unrecognizable to the less keen perceptions of the average man. America has to-day many men of Carroll's caliber, but unfortunately the stewardship of great talents has too often been so prostituted to the coarse occupation of mere money getting and hoarding that the spiritual growth has been stunted and the great opportunity left unrecognized.

I remark also, not to praise my country but to lament the fact, that there are many of our young men with like talents who, lacking Carroll's energy and persistence, and needing the stimulus of encouragement to do great things, fall by the wayside, unable to surmount the obstacles which choke the way.

To-day, while the entire medical profession mourns Carroll's loss, our daily papers are filled with the eulogies of the numerous insignificant heroes of our common political life, and we, who by our contact with these devoted lives have been endowed with a clearer vision of the better things, feel keenly the shame that our whole country does not even know of; much less does she lament this our last great loss, although this is the critical time when she ought to be hastening to the house of mourning to ask what honors we may confer upon those heritors of his time whose lives were dearer to him than his own.

But what lessons do Carroll's and Reed's lives teach us of the medical profession? Not I think that we should at once set ourselves to strive to do great things, but rather that we should do well the daily task, and to strive after thoroughness in the commonplace events of our every day life, as the best preparation for the great opportunity if it presents itself.

Could Carroll send back a message to us who still live and toil, I am sure he would declare his life well spent did he but know that he had inspired any of his brethren to faithfulness in little things, and while not indifferent to the kindly sympathy of appreciative friends, to be yet serene and satisfied at the end with a consciousness of a duty well done, even though it won no plaudits from the world.

One who saw these things in their due proportions, and who understood as no man has ever done their relations to things eternal, once gave this encouragement and seal of approval to such, in the words: "Well done, good and faithful servant. Thou hast been faithful over a few things; I will set thee over many things: enter thou into the joy of thy Lord."

DR. WELCH:

Dr. Kelly has given you a picture of Dr. Carroll's professional life. But I recall well his first appearance in the laboratory. He had entered the army as a private soldier in the ranks and was then a hospital steward. Dr. Pilcher and Dr. Price, army surgeons, helped him to obtain a medical education, and he had just come from a course of lectures in New York City.

Dr. Reed was sent here in 1889 by the surgeon-general with instructions to attend the clinics, Dr. Osler's, Dr. Kelly's, and Dr. Halsted's, and to leave the laboratories alone. A not altogether wise surgeon-general. But later Dr. Sternberg became surgeon-general. Himself a pioneer in laboratory experimental work, he urged Reed to undertake the same.

I remember well the joy and inspiration with which Reed entered the laboratory and undertook the work. He seemed overcome with the opportunity afforded him. There was an unusual group of men working there then. Dr. Councilman was my first assistant. Dr. Flexner had just come. Dr. Lafleur, Dr. Thayer, Dr. Barker, I think, Dr. Abbot, and Dr. Nuttall were all there. A rather interesting family! And Reed was taken in and of course influenced by them all.

Here his bacteriological training was acquired; here he took the elementary courses. Afterwards he carried on work independently. It was during this period that Carroll came to assist him. He was still a hospital steward and so subordinate to Reed, helping him in making media, assisting in experiments, and doing the simpler things. His peculiar aptitude soon became evident, however, and he was allowed to take the regular courses.

This was his first introduction to Reed, and their association was later continued in work carried on in the Army Medical Museum in Washington.

Reed established his reputation as a creative investigator in bacteriology in a short time. While here he was interested in reproducing the focal necroses in the liver found in typhoid fever by injecting the typhoid bacilli into the vessels leading to the liver, and these lesions hitherto considered lymphomata were proven to be simply necroses. This was a very pretty piece of work. He also made a study of the diphtheria bacillus. And so when called to head the Commission he was recognized by all as qualified for the position.

Carroll was very intimate with Reed and his training and reputation were due to this association. They frequently came back here together to attend lectures, two or three times a week, and kept fully in touch with the research work going on in the laboratories.

It was from insight into his character that Reed was selected as leader of the Commission, but no one could have been found as a more efficient aid to Reed than Carroll. Lazear was the third member. Dearly loved here and a member of Dr. Osler's staff, he was more broadly educated clinically and pathologically than any other man upon the Commission. He was unusually well prepared for this work by having studied the mosquitoes and malaria with Dr. Thayer. Agramonte was an immune and a most useful member.

This unusual piece of scientific work before the Commission was accomplished by the most economical method. Dr. Sternberg had done all that could be accomplished with the known bacteriological methods to ferret out a specific organism as the cause of yellow fever. A commonplace experimenter would have pursued that line, and a sterile research would have resulted. There were a number of points of attack, only one of which, however, appealed to Reed as useful. That was the isolation of an organism from the stomach and intestines which would be agglutinated by the patient's blood.

The mosquito theory of yellow fever had been brought forth by Dr. Finlay in 1881, twenty years before. The work was discredited, and a special lack of credence was given it because of the discovery by Finlay of a micrococcus, a tetrad, as the specific organism. Finlay's attempts to demonstrate the rôle of the mosquito were in vain, and we now know the reason why. The blood of the patient contains the virus only during the first three days of the disease, and the mosquito is unable to transmit the virus until an incubation period of twelve to fourteen days is passed. But I think great credit is due Finlay for sticking to his theory through thick and thin. And I am glad the Liverpool School of Tropical Medicine has recognized Finlay, along with Gorgas and Theobald Smith, awarding them medals for their work in tropical medicine.

The Commission, I believe, shared in the popular lack of credence of the mosquito theory. But I know of no piece of work so well undertaken to get the answer from Nature. They first settled definitely that Sanarelli's *Bacillus icteroides* was not to be found constantly in the blood. The second question they took up was, Is the virus of yellow fever present in the blood? This involved experiments upon human beings with the virus of one of the most deadly diseases. Would you undertake it? I cannot say that I would. And yet it was not done rashly. The great responsibility was fully realized by Reed. Failure involving the death of some of the patients without throwing any light upon the disease would have made the experiments the subject of great reproach.

But it has been the greatest triumph of scientific medicine,

the means of saving thousands of lives. And the courage in those men to make that experiment is ever to be wondered at.

They determined that the virus was in the blood, and that during the first three days the blood would convey the disease by inoculation. Of course, the same is true of malaria, and this does not reveal the nature of the organism. Every student should read the original three articles. For clearness of presentation and absolutely convincing proof they are unexcelled.

Carroll was the most heroic in this work, as he was the first victim. Lazear performed the first experiment, but Carroll was the first to submit to the bite of a twelve-day mosquito. And his was the most severe attack of all. Fortunately no case died during these very carefully planned experiments of the Commission.

The Commission demonstrated:

1. The futility of Sanarelli's claims.
2. That the virus is in the blood.
3. That the virus is conveyed by the Stegomyia mosquito.
4. That the patient is a source for transmission only in the first three days of the disease.
5. That the virus must then undergo an incubation period in the mosquito of twelve to fourteen days.

I was perhaps the first to suggest to Reed the importance of testing the filtrate of the blood of a patient. Carroll was designated to carry out these experiments, important in placing the virus among the class of filtrable viruses. The working party sent out by the Pasteur Institute later confirmed this work.

Reed was the leader in fact and name, but Carroll was well trained for the work. A virile, manly, and courageous type, willing to sacrifice his life! The most heroic of all the members.

But Reed was no coward. He was ready to submit himself as a victim, and thought he ought to return and do so, even when it was unnecessary. But he was forbidden to do so by Gen. Sternberg, I think. Lazear also was a hero.

What a service to mankind! Is there anything comparable? Jenner's? Yes, I think so! The Commission proved that complete eradication from the face of the globe of the greatest and most dreaded pestilence that affects mankind is possible. A disease which in a single epidemic has caused the loss commercially of ten millions of dollars to such a city as New Orleans. And in the construction of the Panama Canal our country is demonstrating to the world the value of the Commission's work. It was an inestimable service to mankind.

One other matter. After such an unselfish life, Carroll has died, leaving a widow with seven children to educate, in needy circumstances. And I propose (and I am grateful to Dr. Cattell, the editor of *Science,* for the suggestion) that we make it the sentiment of this meeting to apply to the Carnegie Hero Fund for contribution for the support of Major Carroll's widow and children.

I know of no more deserving disposition of the fund, of no hero more worthy!

DR. THAYER:

'Tis sad indeed that, after so brief a period, we should meet again in this room to pay tribute to the memory of another of that little group of men who will always be remembered as the conquerors of a great pestilence.

That Lazear and Reed and Carroll, so young, so vigorous, so strong, should, one after another, be taken away in the midst of their careers, seems a strange and cruel stroke of fate. One is almost overwhelmed by the pity of it all—by the thought that after years of hard work—the deserved recognition by the government but just acquired—with the prospect of happy and honoured days with his growing family and his chosen work, Carroll, too, should have had to go.

And yet, despite one's self, the same feelings rise that have come to us all during the past few years, as we have thought of Lazear and Reed. How often do we measure the happiness and success of a man's life by the accident of his death![3] How often do we allow the sudden or tragical end of a noble and useful and happy career to overshadow in our minds the brightness of that which has gone before!

With all the tragedy of their untimely end these men have led happy and successful lives.

We go through life, each member of the human ant hill, buoyed up by our better and happier thoughts and aspirations and ambitions; each has in him the feeling that there is in this world something that he can do or say or write or inspire that is new or great or exalting. In our struggles—in our dreams, we seem almost to reach it. We cannot—we will not—we must not realize that the end can come before this something is accomplished. And so, reaching out, straining, too often, alas, groping for the elusive opportunity, we go our way, one after another, millions on millions. And the unexpressed thoughts and ambitions and aspirations die with us—futile except in so far as they have guided us to better lives. How few, how very few of us leave behind much more than the affectionate admiration and love of our immediate friends!

But these three men have left a lasting monument. They have accomplished a small part perhaps of what their generous hearts may have hoped—but that which has proved a great and blessed gift to mankind. They will never be forgotten and their example will stimulate hosts of men to more earnest effort.

Who shall say that these have not been enviable lives?

And what a fine example Carroll has left us! Born in the old country—our old country, England—a poor boy, he brought to us those qualities which we love to call English—honesty, simplicity, fearlessness, steadfastness of purpose. Working his own way, beginning his medical studies at an age when too many begin to abandon theirs, he helped to accomplish this great work.

[3] Maeterlinck: La sagesse et la destinée, Paris (Charpentier), 1899, 122.

A patient student, an earnest worker, an honest man; it fell to him and his fellows to make one of the great discoveries of the age. And now, alas, as if jealous fate had decreed that this work were enough for one life-time, he has joined his two colleagues in bidding farewell to the joys and the sorrows, the ambitions and the disappointments, the hopes and the fears of this world.

But when we think of what these, our friends, have done, in the midst of our sorrow there rises a sense of exultation and pride—for who of us would not change his lot for theirs!

Surg.-Gen. Sternberg, of Washington, D. C.:

There is little left for me to say. I admire Reed, Carroll, and Lazear as you do. And after these comprehensive accounts it is hardly worth while for me to dwell upon Carroll's career.

I think it remarkable that he should work up from a private soldier in the ranks to a position where he is named a major by a special act of Congress. When I named him as a member of the Commission he was known as a trained bacteriologist, an honest and faithful worker. Reed was the leader. But Carroll was his second and capable of independent work.

When Reed came back to Washington, somewhat discouraged, he received a letter from Carroll, saying, "I have taken my mosquito." Two days later came a telegram saying Carroll was sick with yellow fever.

I myself doubted the mosquito theory, but did believe in some intermediate host. I urged experiments with the blood. In fact, I had done one myself in Vera Cruz. I had tried in vain to find a susceptible animal, and knew the experiment must be done upon a human being. I was able then to inoculate a non-immune with blood from a patient in the eighth day of the disease. There was no result, and I made up my mind I needed blood earlier in the disease.

The incubation in the body of the mosquito was probably Reed's idea. And work along that line caused the first success—Carroll's case.

Carroll searched for the specific germ described by the Marine Hospital service and found it a yeast.

Agramonte was a Cuban physician, employed by the New York Board of Health as bacteriologist. He was desirable on that account and because he was an immune. So I had him made a contract surgeon and sent him to Reed and Carroll. He had been made familiar with Sanarelli's bacillus and his search in autopsies and blood cultures fairly settled that question.

The laboratory work was done mainly by Carroll and important additions were made by his individual work.

Dr. H. H. Donnally, of Washington, D. C.:

As a student in the Medical Department of George Washington University I came to know and admire Walter Reed and James Carroll, for both of whom all of the students had the highest respect. The emphasis laid by Dr. W. W. Johnston upon the importance of their courses to us as medical students, was the beginning of my respect for Reed and Carroll, which grew by contact with them in the laboratory.

Reed lectured to us, and model lectures they were, while after the lecture Carroll went around the room from student to student, and patiently demonstrated our specimens under the microscope. Each man received his personal attention, too, although often it was necessary to wait for it well beyond the scheduled hours, as Carroll continued as long as the men waited. More than once has he said, "I like to help the men who are interested in their work, and encourage them." We always got a good demonstration from Carroll, for he was practical, thorough, patient, and kindly.

One understands Dr. Carroll better when one bears in mind that he was a military man, and that of the nearly thirty-four years of his service he spent a number of years as a private and non-commissioned officer in the regular army before entering the hospital corps and finally becoming a medical officer. It has seemed to me that I could trace his point of view upon various matters to the influence upon his mind of this army environment. He always showed much sympathy for the plodder, the student who might be compared to the private in the army. Again, he was most respectful of authority and obedient to those who were his official superiors, being careful not to criticise or express an adverse opinion of them.

Carroll was a good man, and square,—a man of his word. He had an abiding sense of justice, and a strong faith that truth must prevail in time. It was not uncommon to hear him say, "That's all right, you just wait." He was as genuinely modest a man as one could find, usually allowing his rights to lapse, rather than be what to him was self-assertive. He never lost sight of the fact that he was the head of his family, and felt keenly the responsibility of making his efforts count for their sakes. This was the motive power back of his work, and whatever else may have been in his mind, this was prominently there when he deliberately submitted to the bite of the infected mosquito. He reasoned that whichever way it turned out for him, they would eventually be the gainers.

And now one can understand why he lived for five years silently plodding along, yet expectantly looking for material recognition of his work and services to the race—namely, his inordinate modesty combined with a strong belief in right and future justice. About a year ago a stronger quality slowly aroused him to a change in his attitude, and this was his sense of duty to his family. For himself he could wait and work, spending a long full day, often into the night, in the Army Medical Museum, and three evenings a week in the laboratory of the Medical School, gaining an income sufficient to survive upon, but inadequate to his needs. His obligations as father and husband, however, gradually overcame his modesty enough for him to let some of his friends know what apparently few men had previously understood: his real part in the work of the Yellow Fever Commission.

All that he said and more was easily susceptible of discovery from authentic publications and living witnesses. His friends

in Washington and elsewhere, when they realized the truth, took up the matter and saw to it that the facts of his service became generally known. It has been a very short time since Congress meted out more adequate recognition in a material way, two universities (Maryland and Nebraska) conferred honorary degrees upon him, scientific bodies to which he belonged honored him with offices, and more selective scientific bodies admitted him to their membership.

DR. KING, of Washington, D. C.:

I feel very grateful to Dr. Kelly for his kind invitation to attend the meeting to-night, with the purpose of which I sympathize most heartily. I am doubly grateful for the privilege of making a few remarks expressive of my own personal respect for the memory of my former colleague, Dr. Carroll.

You may be gratified to learn that the Medical Faculty of the George Washington University at Washington, in which Carroll was Professor of Bacteriology, some weeks ago placed on record a suitable tribute of respect to the memory of Dr. Carroll; and the Medical Society of the District of Columbia, after its summer holiday, appointed a committee for the same purpose, which will shortly present its report.

It is well known to most of us that the medical and secular press throughout the country (and perhaps the world) have expressed a most enthusiastic appreciation of the heroic career of Dr. Carroll in his humane endeavor to extend the boundaries of medical knowledge in such a manner as to secure to the American people immunity from the dreadful pestilence of yellow fever.

And, still again, the eloquent words of the gentlemen who have preceded me, have, I think, struck the chords of our hearts, as the fingers of a musician strike the strings of his instrument, and have elicited from the deepest recesses of our hearts a responsive thrill of sympathy, respect, and sorrow. What more can I say? Neverthcless, if you will allow me, I should like during the five minutes allotted to me to elaborate and emphasize one idea which has already been referred to by a previous speaker.

Has the American government and have the American people sufficiently realized the actual value (in dollars and cents, if you will) of the demonstration that yellow fever can be prevented by protection from the bite of infected mosquitoes? And if this valuation has been fairly estimated, let me farther ask, have the men who risked their lives to make this demonstration been at all adequately rewarded?

Are republics ungrateful? Certainly ours is not. Our pension roll emphatically contradicts such a supposition. A few years ago, one of our annual pension appropriations was *more than double* the annual expenditure for pensions of four European governments combined, namely, France, Germany, Great Britain, and Austria-Hungary. Our own government has not only been lavishly generous in its distribution of pensions, but it has been (we must confess) prodigally extravagant. It is tacitly admitted that more men are receiving pensions for gallantry during our recent Spanish war than were ever enrolled in Shafter's Army.

Now if it be true that "the very walls have ears," I think the white marble blocks of the Capitol at Washington should blush to witness the annual distribution of millions of money to satisfy the hungry demands of undeserving pensioners, fraudulent contractors, land frauds, post-office graft, and a hundred others, while the widows and children of our sleeping medical heroes, who risked their lives to secure to the American people immunity from pestilence and plague remain without adquate means of support appropriate for the station of life in which God has placed them.

About one-third of a century ago, and therefore still fresh in the memory of some of us older physicians, occurred those dreadful epidemics of yellow fever, which almost depopulated the cities of Shreveport, La., and Memphis, Tenn. To-day we feel perfectly confident that the curtain has fallen for the last time upon these dismal dramas. We remain serenely secure in the assurance that the beams of the rising sun will never recall such tragedies again.

Now if it had been possible during the prevalence of those epidemics to purchase the means of immunity from future similar invasions, at what figure do you think the survivors of their dead would have estimated the value of such a secure immunity? Not by hundreds or thousands of dollars, but surely by millions!

I firmly believe, if the government of the United States should take from its Treasury a solid hundred thousand dollars and present it to the widow of Dr. James Carroll, a similar share to the widow of Walter Reed, and perhaps still another to your own distinguished dead, Dr. Jesse W. Lazear, it would be doing an act that the whole American people would commend and the entire world would applaud.

It has been said that medical officers of the army working on the Yellow Fever Commission, were acting under orders from the War Department, as soldiers are ordered to fall in line for battle. But no authority in the government can order a soldier to inoculate his own body with a dangerous infection, even though it were for the benefit of a suffering world.

If Dr. Carroll were acting under orders it must have been in obedience to the command, "Thou shalt love thy neighbor as thyself and do to others as you would they should do unto you,"—a mandate that does not have the ring of an order by a Department of War.

We have to-night, figuratively speaking, strewn over the grave of the lamented Carroll, a few last roses of summer and we have watered them with tears of sympathy for his family, but of what avail are these flowers in providing the means of life—food, raiment, shelter, education, and recreation—for his bereaved family? If it were possible for material things and easy conditions of life to "pluck from the memory a rooted sorrow" I wish we could hasten the day when the sorrows of the survivors of the man we honor to-night, might, partially at least, be turned into joy just as "drops of water rolling down the cheek of anguish reappear in the rainbow" (Draper) that beautiful emblem of hope.

Dr. Ruffin, of Washington, D. C.:

Certainly Carroll accomplished a great deal in a short time in his life. Very few appreciate the difficulties he encountered. His preliminary education was very slight. He finished his studies at the age of fifteen, and was in Canada on his own resources, penniless and without a helping hand. He worked in lumber camps at ninety cents a day. His course, after entering the army in 1874, has already been reviewed.

His rise from a private was a great achievement. Dr. Sternberg's heart was important in James Carroll's life. He discovered James Carroll! He was his faithful friend. It was Sternberg's influence which brought Carroll to Ft. McHenry, putting the study of medicine in his grasp—his ambition for many years.

The findings of the board are a brilliant achievement. And the courage in exposing himself to the bite of the mosquito has no parallel upon the battlefield. His claim to fame is on the yellow fever work. From 1899 until his death he published twenty-seven articles on this subject. As Professor of Bacteriology in the George Washington University, he was respected by the faculty and literally loved by the students. There was a bond of sympathy of great advantage to both.

In 1902 he was made an assistant surgeon in the army as a reward for his work. Then followed a long period of waiting, hope, and despair. Finally, the justly deserved reward came in his promotion to the rank of major, in March, 1907. The recognition was a great delight to him. In his last days honors were crowded upon him, among them degrees of LL. D. by two universities.

He died as he lived a pure, high-minded, courageous man.

Dr. Cushing:

The lives of these three men many times heard in this room will still be recounted when the names of most here are forgotten.

Dr. Munroe, of Washington, D. C.:

The death of James Carroll, M. D., Surgeon and Major U. S. Army, on September 16, 1907, inflicted a very serious loss upon the George Washington University, and brought sorrow to the hearts of his many associates in the faculties of that institution, with which he had maintained an active connection for some twelve years.

He was appointed a demonstrator in the Medical School of the George Washington (then Columbian) University in 1895 under the supervision of Dr. Walter Reed, Surgeon U. S. Army, who was then and for many years, Professor of Pathology and Bacteriology in this Medical School. In 1903, Dr. Carroll was promoted to Associate Professor of Bacteriology and Pathology, and appointed to succeed Professor Reed, as Pathologist to the University Hospital. In 1905, he was promoted to a full professorship in the Department of Medicine, and also given supervision over the students pursuing researches in bacteriology under the supervision of the Faculty of Graduate Studies.

Professor Carroll's connection with the University included the period during which the University Hospital was created and set in operation, and the new Medical School building, which is well adapted to its intended purposes, was built. Dr. De Schweinitz, Dean of the Medical School, relied much upon the judgment, special knowledge and experience of Dr. Carroll in planning the building; and the excellent bateriological laboratory with which the Department of Medicine is now provided, was largely due to Dr. Carroll's advice and active supervision.

Throughout his connection with the Department of Medicine, Dr. Carroll was a most devoted and assiduous teacher. Kindly in spirit, tolerant in views, in sympathy with youth, lucid in exposition, earnest in manner, a master of his subject and skilled in its technique, he commanded the respect and esteem of his students and compelled, by force of character and restrained enthusiasm, an interest in the subject taught.

When Dr. Carroll became connected with the Medical School the entire course of instruction in this, as in all other professional schools in Washington, was given after office hours and late into the evening, in order to accommodate, not only the many students who were employed in the various departments of the United States Government, but also the eminent specialists who were willing to assist in the promotion of medical education. During his connection, owing to criticism on this method of procedure, the entire plan has been changed, a growing nucleus of professors giving their whole time to the conduct of the school has been formed, with practitioners and specialists grouped about them; the instruction is begun in the early forenoon and continued throughout the day and the plan made to conform to the most approved examples. Throughout this work of reorganization, Dr. Carroll gave able assistance and so adapted the work in his topic and selected his assistants with such excellent judgment that the students continued to benefit by his talents and knowledge, and to be subject to his beneficent influence.

In faculty meetings, as in his teachings and his scientific work, he held to strict standards and high ideals, but while expressing his views with definiteness and maintaining his position with firmness, he manifested a willingness to listen and to be convinced. He differed from his associates without acrimony and accepted an adverse decision without cherishing resentment. In fact, his entire relations were characterized by a determined gentleness and thoughtful consideration.

Dr. Carroll was without doubt ambitious; but his ambition consisted in the indestructible desire to do well everything that he was called upon to do. Whatever work he was engaged upon no matter what might be its extent or importance, he could never be content with doing less than his best. The same lofty purpose and the same careful judgment were applied to all he did, in small things as in great things. No man of his high character and just discernment could be free from likes and dislikes; but no man ever took more care to avoid injuring by word or deed those who failed to win his esteem or regard. Free from malice and prejudice; calm and dispassionate in

judgment; even in temper; kindly and amiable in manner he kept on good terms with those about him. But the trait in his character which perhaps most forcibly impressed those who came in contact wth him was his absolute straightforwardness and reliability. He was utterly without subterfuge or reservation. He was a man in whom you felt implicit confidence. There was therefore no man in the faculties who commanded more universal respect and regard than James Carroll; and none have died more universally regretted.

DR. J. O. SKINNER, of Columbia Hospital, Washington, D. C., who was unable to be present, sent an interesting paper from which the following extracts are made:

When Hospital Steward, William Grant, U. S. Army, first met James Carroll—then 1st sergeant of Company C, 7th U. S. Infantry at Fort Snelling, Minn., where they both were stationed in 1882—he seemed to recognize in Carroll the material suitable for higher and better work than that in which he was then engaged, and suggested to him the idea of studying for the position of Hospital Steward, U. S. Army, and offered to place at his disposal certain opportunities which were then and there available for the purpose. This was a vitalizing stroke on the part of Grant, and a vital moment in the life of our lamented friend, for he promptly took advantage of the offer and made such good use of it that in the summer of 1883, he was examined by the late Major W. C. Spencer, Medical Corps, U. S. Army, passed an excellent examination and was appointed Hospital Steward, U. S. Army, September 15, 1883. Previous to this systematic and successful effort on his part, Carroll had, no doubt, rather indefinite and uncertain ideas of how to work, although he was ready and anxious to do *something* to better himself and his fellowman.

We find his duties in the capacity of hospital steward carrying him to different stations in the Department of Dakota, including the post of Fort Custer, Mont., where he came under the observation and command of Capt. James E. Pilcher, Medical Corps, U. S. Army, now retired, who further encouraged and assisted him in his chosen field of work. From Fort Custer, Montana, he took a leave of absence the latter part of 1886, and proceeded to New York City and began the study of medicine at the University of the City of New York during the season 1886-7. On completion of his leave of absence, and the close of the session, he returned to the Department of the Platte, where he was on duty from September, 1886, to February, 1889, when he was ordered for duty to Fort McHenry, Maryland, where that efficient officer and estimable gentleman, himself a Marylander by birth, Capt. C. B. Byrne, Medical Corps, U. S. Army, was post-surgeon. Again was Carroll most fortunate in the environment of this detail since Capt. Byrne (now Colonel Byrne of the Medical Corps, and on duty in the Philippines) belonged to that appreciative class of officers always ready and willing to further the wishes and promote the interests of good and worthy men.

What might have been expected really occurred for Carroll graduated in medicine from the University of Maryland in 1891, and took his post-graduate course in pathology the same year, and in bacteriology the following one (1892) at the Johns Hopkins Hospital. The seed which had been sown in Fort Snelling, Minn., 10 years previously had now grown into a promising plant!

During the World's Fair at Chicago, Illinois, 1893, we find him there assisting Capt. L. A. Le Garde, Medical Corps, U. S. Army, himself an eminent and efficient bacteriologist as well as an accomplished surgeon, in the work for which he was specially selected by the surgeon-general of the army. At Chicago and elsewhere he had demonstrated so well his fitness for certain kinds of experimental work that General Geo. M. Sternberg, then Surgeon-General, U. S. Army, had him assigned to duty at the Army Medical Museum, Washington, D. C., where he remained on duty—engaged in scientific pursuits—until detailed for duty in Cuba in connection with that great and glorious work of investigating the cause or causes of yellow fever by the late and greatly lamented Col. Walter Reed, Medical Corps, U. S. Army, and his able and self-sacrificing associates, Dr. Carroll's status having been changed in the meantime (1898) to that of acting assistant surgeon, U. S. Army, which latter position he continued to hold until appointed first lieutenant, assistant surgeon, in the Medical Corps of the Army, Oct. 21, 1902.

Since that time the character of his work, the manner in which it has been done, the results of the investigating board of which Reed, as president, was the guiding spirit, and Carroll as an associate, a most conscientious and capable cooperator, are too well known to the scientific, medical, ethical, and commercial worlds to repeat here and now.

This, then, is a brief—a very brief—review of the services and record of Major Carroll's life as it is known to those familiar with the more important events of the history of their country, and with the men who have assisted in making that history, but there is a personal and private element in the services and sacrifices of the subject of these remarks which cannot, should not, and must not, be forgotten or ignored. John Boyle O'Reilly once wrote that

> The greatest happiness we can ever know—even the milk of humanity—comes not from love, but from sacrifice.

The Sanarelli theory of the cause (*Bacillus icteroides*) of yellow fever had, by substantial proof to the contrary, been eliminated from further consideration by the Reed board; the mosquito theory of Finlay was now to be tested practically, and this theory the members of the board had, from their observations and investigations, good reasons for believing to be the correct one. In becoming an anxious candidate for the demonstration of this theory in which he had great confidence was not then Carroll's greatest happiness in thus risking and, if necessary, in sacrificing his own life in order that thousands of others might be saved by the result of the experiment? But this was only a part of the sacrifice—and to every manly mind the minor part; the little flock of loved and loving ones he had left behind—they who bade him farewell so tearfully and saw him leave so sorrowfully—were a part—a major part

of the sacrifice he might have to make to prove his case, for was he not their only protector and provider against the vicissitudes of life? There is not a better rule to guide or govern us than the golden rule, and in a modified way it is applicable in this instance. Had any one of *you* been situated as he was, what would have been *your* reflections and resolutions? Ask yourselves, for this is a question that only your courage and conscience can answer. Physical courage, it is alleged by those of observation and experience, is not so rare as some suppose, and it is frequently made less so by the excitement usually incident to the testing of it and also probably by a *gaudium certaminis* more or less natural to every healthy mind and body; but moral courage is, indeed, a rara avis under all conditions and circumstances. Was it not this latter kind of courage combined with the former—this great moral duty to mankind when the opportunity came to Carroll to perform it—which prompted him to take this desperate risk of surrendering not only his own life, but also, *pro bono publico*, the guardianship of his dear and devoted family?

The spirit and determination which actuated him in this matter is well described in a resolution adopted by the American Public Health Association at its annual meeting, September 30 to October 4, 1907, at Atlantic City, and which reads as follows:

Resolved, That this Association recognizes in the death of Major James Carroll, of the Medical Department of the United States Army, not merely the loss of an intelligent and efficient working bacteriologist from among its members, but the departure from this life of a rare hero who with deliberate courage accepted the very serious risk of demonstrating in his own person that theory of the transmission of yellow fever, whose proof has made possible the control, by prevention, of that disease. When Dr. Carroll volunteered to make in this way a vital test of Walter Reed's experimentation and reasoning and thus to assist in establishing its truth, he intelligently accepted a risk greater than that of battles and of far more importance in its consequence to the world than would be the sacrifice of any individual active warrior. He took part in a conflict whose outcome, thanks to his courage and that of his companions, has given the world practical immunity from one of its greatest scourges.

Resolved, That this Association shall present to the War Department of the United States, through the Surgeon-General of the Army, this appreciation not only of Major Carroll's heroic conduct, but of the value of his service to the people whom the Association represents; and also that it presents to his family its acute sympathy in this bereavement tempered only by the conviction that his memory will be held in respectful esteem as long as the history of preventive medicine shall be a part of the record of the progress of the race.

During Major Carroll's fatal illness in this city, heroic traits of character were beautifully illustrated by the dauntless spirit and constant cheerfulness with which he always confronted the grim specter of his increasing debility, and approaching dissolution. His face was always wreathed in smiles when every one knew his heart must have been laden with sighs and bathed in tears—

> "For the test of the heart is trouble
> And it always comes with the years,
> And the smile that is worth the praises of earth
> Is the smile that shines through tears."

Not once did he hesitate or falter. Day after day he lay on what he must have well known, was his death bed, without a murmur of despair, a word of reproach, or an expression of regret except his inability to be active and useful. He seemed to feel he had fought a good fight; he had finished his course; he had kept the faith.

We are attempting now and here to commemorate, in a fitting manner, the virtues and worth of our departed friend, but should not something be attempted in consideration for his grief-stricken widow left without his solace and support; some tangible comfort; some material assistance, by which with the increased burden of her cares and responsibilities she may, in a measure at least, be relieved? In what way and by whom shall this be done?

THE MATERNAL MORTALITY IN THE FIRST 5000 OBSTETRICAL CASES AT THE JOHNS HOPKINS HOSPITAL.

By Francis C. Goldsborough, M. D.,

Instructor in Obstetrics, The Johns Hopkins University.

(*From the Obstetrical Department of the Johns Hopkins Hospital and University.*)

The advance of medical science in modern times is apparent to everyone who pays even slight attention to the current publications, but that this knowledge can be applied so as to be a more efficacious means of preventing death is sometimes doubted. It must be granted that a great part of the contributions to medical literature, whether from the laboratory or the clinic, have no immediate practical value. Nevertheless, every fact which is added to our knowledge of the body or to a better acquaintance with the varied influence of our environment upon health, will ultimately increase the practitioner's ability to combat sickness and death. The art of medicine will sooner or later follow every progressive step taken by the science of medicine.

However, we are not dependent upon theoretical considerations for our confidence in the present-day improvement in medical practice. In obstetrics the improved results are most strikingly manifested in connection with puerperal infection. Only a little more than fifty years have elapsed since death from this cause alone occurred in ten out of every hundred women delivered in the large European hospitals while at

present the maternal mortality from this cause has been reduced to between 1/5 and 1/10 of one per cent in many well conducted Lying-in Institutions.

At the suggestion of Dr. Williams I have reviewed the records of the first 5000 cases in the Obstetrical Department of the Johns Hopkins Hospital for the purpose of determining the maternal mortality, as well as the relative seriousness of the various complications which occurred in this series of cases.

It should be understood that the temptation "to correct" our statistics has been avoided. Every death occuring in the service for the period covered by the statistics has been included, although in some instances the fatality was attributable to intercurrent affections and in no wise to the obstetrical condition of the patient. These number 55, and in consequence the total maternal mortality for the series is 1.1 per cent. For the sake of completeness, I append abstracts of the fatal cases at the end of the article.

The Obstetrical Department of the Johns Hopkins Hospital embraces two services; namely, the Outpatient Service, in which the patients are attended at their homes, and the House Service, comprising the cases which are treated in the hospital. The first is somewhat larger, so that my statistics include 2750 out-door and 2250 house patients. Whenever possible, abnormal or complicated cases occurring in the outside service are brought into the hospital. This explains the preponderance of fatalities among the hospital cases, among whom 48 out of the 55 deaths occurred.

Of the 5000 cases, there were 4631 (92.62 per cent) delivered at term, while 369 (7.38 per cent) failed to progress so far; roughly speaking, a proportion of twelve to one. On the other hand, when the 55 fatal cases are considered from the same point of view, we find that the number of maternal deaths after the delivery of mature children is actually only three times greater than that obtaining among the comparatively small number of women who had not advanced to term. Thus, there were 41 deaths, or 74.54% of all fatalities, in women delivered at term; 12 deaths, or 21.81% of all fatalities, in women delivered prematurely; 2 deaths, or 3.64% of all fatalities, in women undelivered and premature.

In other words, there was a mortality of 0.89% in the former as compared with one of 3.79% in the latter group.

The significant difference between a mortality of 0.89% after delivery at term and 3.79% after premature delivery may be in great part accounted for by the more frequent occurrence of infection in cases of abortion, a point which can be discussed more appropriately in a later paragraph. Yet, in addition to this, it must be remembered that toxæmias, as well as excessive bleeding in pregnancy due to placental abnormalities, occasion in themselves, or through the operative measures which they necessitate, a number of fatalities before the completion of full term.

For further study of our 55 fatal cases it is convenient to classify them according to the cause of death. This is not altogether satisfactory, since in certain instances more than one serious condition was present and consequently it is difficult to determine which of them played the greater part in the production of the fatal issue. Thus, in some of the eclamptic cases virulent infections were also noted, and in others cervical lacerations of an extreme degree, either of which may have superseded the toxæmia as the actual cause of death. On the whole, however, it is most satisfactory to divide the cases as follows:

Group I. Infections.
" II. Toxæmias.
" III. Hæmorrhages.
" IV. All others.

GROUP I. INFECTIONS.

We find here the most frequent cause of death, the group including 21 cases, or 38.18% of the entire series. From this it follows that in the 5000 cases the gross mortality from infections was 0.42%.

Of the twenty-one patients, sixteen died in the hospital and five in their homes while being cared for by the Outpatient Service; nine being operative, and six spontaneous full term deliveries, together with six abortions. One case of pyelitis is included in this group in which a spontaneous miscarriage occurred. The autopsy revealed a general pyæmia. While the death was not due to puerperal infection strictly speaking, it is most conveniently grouped here.

The relation of operative procedures to obstetrical infection, as illustrated by these statistics, is instructive. Of the 5000 cases under consideration, 655 were operative, a percentage of 13.1, with a mortality from infection of 1.37%; as compared with 0.1% in the patients who were delivered spontaneously at term. The nine fatally infected operative cases include:

Symphyseotomy (the only one in the series)	1
Craniotomy on dead child (infected before seen)	2
Cæsarean section (pelvic dystocia)	2
Manual removal of placenta	2
Forceps and removal of placenta	1
Accouchement forcé (eclampsia)	1

As far as could be determined from the clinical history and the autopsy findings, the cause of death in the foregoing nine cases was peritonitis in six, pyæmia in four, pulmonary embolism in one, and endocarditis in one.

A word of comment is merited by the relatively frequent history of abortion among the fatal cases of infection, almost one-third of the infections having followed this condition. In each of the six instances the patient was already infected on admission to the service, as was demonstrated by the routine intra-uterine culture, which is taken in all suspected cases before any treatment is instituted. It is not unlikely that most or all of the abortions were the result of criminal procedures, undertaken without regard to aseptic precautions; as the experience in this clinic with therapeutic abortions, indicates that the latter operation, if properly performed, is not attended by any greater risk of infection than in delivery at term.

The responsibility for the 21 fatal infections in our statistics may be fairly placed as follows. In twelve instances positive evidence of infection was present when the patients were first seen by a member of the department. In another case the patient admitted having had coitus at the onset of labor, sixteen hours before the birth of the child, and the infection seemed to be definitely attributable to the former event, since no vaginal examinations were made during labor. In two other instances it is impossible to fix the responsibility for the infection, since the patients had been examined by individuals with defective technique before they were sent to the hospital. In the remaining six cases the department is wholly responsible for the development of the infection—one-eighth of one per cent.

The instances in which the department had exclusive care of the patients included—

(a) *One Symphyseotomy.*—Here the incision became infected and subsequently the pelvic veins. Death occurred suddenly on the ninth day of the puerperium. A pulmonary embolus was suspected clinically, but could not be demonstrated at autopsy.

(b) *Two Cæsarean Sections.*—The first of these was performed in the patient's home amid very dirty surroundings. Infection of the abdominal incision resulted in a fatal general pyæmia. The second patient was operated upon at the hospital, after a single vaginal examination. Laparotomy was done after the patient had been in the second stage of labor between two and three hours, when the temperature was above normal and the pulse rapid. Symptoms of peritonitis developed on the third day, and death resulted from an intestinal obstruction.

(c) *One case* from which the *placenta* was *removed manually* died from infection with *B. ærogenes capsulatus.*

(d) *Two cases delivered spontaneously* in the Outpatient Service died of septicæmia. Each was examined by vagina twice.

The first of the two cases, in which it is unlikely that infection occurred at the hands of the department, had been under the care of a midwife for some hours previous to entering the hospital. She was ultimately delivered by accouchement forcé. Death occurred on the eleventh day of the puerperium. The second patient, likewise, had been examined vaginally by a midwife without due regard to cleanliness. She was delivered by an easy low forceps operation, after which it was necessary to remove the placenta manually.

An analysis of the bacteriological findings in the various cases showed that the infecting micro-organism was in seven cases pure streptococcus; in one case a streptococcus and *B. coli communis;* in one case a streptococcus, *M. gonorrhœæ* and *B. ærogenes capsulatus;* in one case a streptococcus and *B. ærogenes capsulatus,* and in two cases *B. ærogenes capsulatus* alone. In one patient admitted on the twenty-third day of the puerperium, the uterine culture was sterile, but the patient died the following day of ulcerative endocarditis. In eight cases I was unable to obtain any record of the bacteria concerned.

Group II. Toxæmias.

The more thorough appreciation of the importance of asepsis at the time of delivery has so reduced the mortality from puerperal infection that it is at present only a slightly more important cause of death in obstetrical practice than metabolic disturbances. In the 5000 cases under consideration there were 16 deaths from the various toxæmias of pregnancy—more than one-fourth of the total number. These can be best considered according to their pathology, and include fatalities from eclampsia, nephritis and toxæmic vomiting.

Eclampsia was the most frequent form of toxæmia met with in this series. The 12 cases under this head represent a total mortality of 0.24%, and constitute 22% of all the fatal cases.

During the period covered by these statistics there were 48 cases of eclampsia treated by the department, which may be classified as follows: Antepartum, 27 cases (56.25%); intrapartum, 7 cases (14.58%); postpartum, 14 cases (29.17%); total, 48; with 8, 2, and 2 deaths in the several groups, respectively. Therefore, the mortality in this clinic from the disease in question is 25%. Its varying seriousness in each group is represented by a percentage of 29.63, 28.57, and 14.29, respectively.

One-half of the fatalities from eclampsia occurred within 12 hours after admission to the hospital and the patients were in extremis at that time. With the remaining six, death occurred in two after 18 hours, in one after 36 hours, and in the others on the 4th, 7th and 8th days. Case No. 571, in which death was clearly due to puerperal infection on the 11th day is not fairly included among the fatal cases of eclampsia.

In two of the fatal cases (Nos. 909 and 1722) the diagnosis rested entirely upon the autopsy findings. Clinically, they escaped recognition, since convulsions were entirely absent during the course of the disease. The pathological picture in each, however, was that characteristic of eclampsia. These cases have recently been described in detail by Slemons in his article upon eclampsia without convulsions.

Nephritis.—It is generally conceded that nephritis may give rise to intoxications during pregnancy independent of its association with eclampsia. Two such cases terminated fatally in this clinic. In one the post-mortem findings clearly demonstrated the nature of the toxæmia; while in the other, although no autopsy was allowed, the history and the clinical picture would permit no other diagnosis.

The first of these (Case No. 9) could not have been distinguished from eclampsia clinically. The well-known premonitory symptoms had been observed. A convulsion occurred during labor and was followed by coma. The patient partially recovered from this, but remained semi-conscious for a number of days, and died one month after delivery. At the autopsy no lesions were found in the liver, but the kidneys were the seat of marked interstitial changes, demonstrating a chronic nephritis as the cause of her toxæmia.

The other patient (Case No. 198) presented symptoms of threatened eclampsia, such as headache and albuminuria with

casts. She was delivered on account of the evidences of a profound toxæmia, but failed to improve subsequently. Death occurred on the 18th day of the puerperium, the patient having been in a semi-stupor most of the time since delivery. Although an autopsy was not permitted, the marked clinical similarity with the case just cited indicates that the two should be classed together.

TOXÆMIC VOMITING.—Two fatal cases of vomiting of pregnancy appear in this series and bear a striking clinical resemblance to each other. In each instance the uterus was emptied in the third month of pregnancy, and in each death occurred at the end of 48 hours.

Case No. 650 occurred before the association of a central liver necrosis with these cases had been pointed out. The autopsy note only states that fatty degeneration was present and makes no comment on its localization. Case No. 2116, which is described in detail in Dr. Williams' Monograph upon vomiting of pregnancy, exhibited clinically a very high percentage of nitrogen eliminated as ammonia, but unfortunately an autopsy was not allowed. -

GROUP III. HÆMORRHAGE.

There were eight deaths in the 5000 cases attributable to excessive loss of blood, a mortality of 0.16%. Viewed from the total number of deaths in the series, of which they constitute 14.54%, these fatalities demonstrate the importance of hæmorrhage as a cause of death in obstetrical practice. The figures show it to rank third in this connection, being preceded only by infection and toxæmia.

The anatomical basis for the excessive loss of blood was most frequently placenta prævia, which was present in precisely one-half of the cases that died from hæmorrhage. This abnormality was observed in 13 of the 5000 cases, a mortality of 30.8%.

The great danger of death from hæmorrhage in placenta prævia depends primarily upon the location of the placenta, and this in itself may give rise to such an acute loss of blood as to cost the patient her life before treatment can be instituted. Thus, in two of our cases the exsanguination was so extreme on admission to the hospital that death was practically simultaneous with their entrance into the ward. Similarly in the third case, although the patient lived for two hours after admission, death could be ascribed only to the profound anæmia occasioned by the bleeding before and during delivery, and was not attributable to traumatism of the birth canal.

It is important to remember, however, that in many cases of placenta prævia death may result from complications incident to its treatment, and of these none is more potent than deep lacerations of the cervix and lower uterine segment. This is illustrated in our fourth case, in which the sequence of events was as follows. The patient was sent into the hospital at the eighth month of pregnancy with a history of bleeding. While a vaginal examination was being made to determine its cause, a profuse hæmorrhage resulted from the introduction of one finger into the cervical canal, which was found to be dilated to approximately 2 cm. with the internal os entirely covered by the placenta. It, therefore, seemed expedient to deliver the patient at once and accordingly the cervix was dilated manually without the least difficulty, the placenta perforated and the child extracted by the breech. There was only a normal loss of blood after the completion of delivery, but two hours later the patient suddenly collapsed and died before any treatment could be instituted. The autopsy disclosed a relatively slight laceration of the cervix, and a large subperitoneal hæmatoma resulting from an incomplete rupture of the lower uterine segment which involved one of the branches of the uterine artery.

It is probable that a better result would have been obtained by the use of a slower method for dilating the cervix; and in this clinic experience has led to the use of the Champetier de Ribes' balloon in such cases whenever possible. As the cervix is usually softened and sometimes partially dilated in this class of cases, rapid manual dilatation might appear to be the operation of choice, except for the fact that the consistence of the cervix under these circumstances renders it more liable to deep laceration than usual. Accouchement forcé should be avoided whenever possible.

The danger of this procedure is likewise demonstrated in another of our deaths from hæmorrhage. This occurred in a patient suffering from chronic nephritis who was delivered by accouchement forcé. Following the operation a cervical laceration was noted and repaired, and the uterus and vagina were packed with sterile gauze. The patient left the operating room in good condition, but died very suddenly four hours later, with some external hæmorrhage and a large subperitoneal hæmatoma.

In one instance (Case No. 2201) death from hæmorrhage was associated with complete rupture of the uterus. The patient was admitted in a state of shock, prolonged attempts at extraction of the child having been made before the physicians in attendance decided to send the case into the hospital. On examination it was found that the child had been expelled into the abdominal cavity, with the exception of the feet and legs, which remained within the lower uterine segment. Tentative, but unsuccessful, traction was made upon the most accessible lower extremity in order to determine the possibility of delivering the child through the rent in the lower uterine segment, and the patient died before a laparotomy could be performed.

Case No. 1548 died from hæmorrhage in the course of a Cæsarean section, rendered necessary by a contracted pelvis. As the previous labor had been terminated by Cæsarean section, a hysterectomy was determined upon on this occasion. Profuse bleeding had occurred during the delivery of the child and continued. Following the amputation of the uterus there was such unusual hæmorrhage from the cervical stump that death occurred before it could be controlled.

Fatal hæmorrhage on the fourth day of the puerperium occurred in Case No. 1370 of the Outpatient Service, which

was reported by Bettman. The autopsy showed an incomplete rupture of the lower uterine segment which had been brought about by the impaction in the pelvic cavity of the hypertrophied non-pregnant horn of a bicornuate uterus.

Group IV. All Other Causes.

It is necessary to place together in a miscellaneous group 10 of the 55 fatal cases in this series, since they do not readily fall into either of the previous groups. The fatal complications in this division are frequently not strictly obstetrical, yet they are purposely included in this list, as it is desired to account for every death in the 5000 cases.

Intestinal obstruction has been found at operation or autopsy in three cases without any other obvious cause of death. In two instances it represented a postoperative complication of Cæsarean section. Case No. 1256 died on the third day after an enterostomy had been performed. At the operation there was no sign of peritonitis and the high degree of intestinal distension could be accounted for only by a blocking of the gut by unusual numbers of round worms. In Case No. 2158, likewise a Cæsarean section, the obstruction was due to adherence of a loop of the small intestine to the abdominal incision. The adhesions were freed at a secondary operation, but death ensued.

The third instance of intestinal obstruction occurred independently of a previous laparotomy. This patient was delivered per vias naturales and the morning after the operation was apparently in good condition. During the day marked abdominal distension developed, the pulse became very rapid and respiration labored. Death occurred suddenly 28 hours after delivery. The clinical diagnosis was "cardiac failure," but the autopsy revealed definite intestinal obstruction. At the left cornu of the uterus the gut was firmly held by an old adhesion. The change in size of the uterus consequent upon the termination of labor had brought about a kink in the gut and an obliteration of its lumen. The unusual distension of the abdomen compressed the thorax, thus accounting for the labored respiration and probably explaining the sudden cessation of the heart beat, since a myocarditis was present.

Intercurrent Medical Diseases were accountable for three deaths.

Typhoid fever developed in one patient about two weeks before term. She was delivered spontaneously after a very short labor, but slowly became worse and died on the twenty-first day of the puerperium. Typical lesions were found at autopsy.

Pneumonia complicated with chronic heart disease caused the death of another woman at the eighth month of pregnancy. Labor had not supervened and she died within 24 hours after entering the hospital.

The third death from a purely medical complication occurred in a woman at the fifth month of pregnancy, suffering from amœbic dysentery. She fell into labor and was delivered spontaneously. Death occurred two days later.

Thrombosis of the left common iliac vein occurred in one patient who had worn a tight bandage about her abdomen throughout pregnancy for the purpose of concealing her condition. The binder had also been effective in producing intestinal paralysis and thrombosis of the left common iliac vein. She was admitted to the ward with unmistakable signs of obstruction. On this account labor was induced and death followed 12 hours after delivery. At autopsy an embolism was sought for, but none could be found. I reported this case in detail in the Bulletin of the Johns Hopkins Hospital for June, 1904.

Embolism of the pulmonary artery was the cause of death in Case No. 962. This patient was delivered by low forceps. Shortly after the completion of labor her temperature was 101.2°, but quickly fell to normal and subsequently did not rise above 100.4°. No abnormality was noted in the puerperium until the 12th day, when the patient suddenly complained of pain in her chest and difficulty in breathing while the breasts were being massaged. Death occurred two hours later. The autopsy revealed a cystitis associated with thrombosed veins in the pelvis, which had been the source of the embolus which had lodged in the pulmonary artery.

Exophthalmic Goitre was the only apparent cause of death in Case No. 2181. The patient was at term and probably in labor on admission to the hospital, although she complained only of dyspnœa. About six hours later pains began and the child was born within an hour. Immediately after its expulsion she collapsed and did not rally.

Anæsthesia would seem to be accountable for but a single death in the 5000 cases, and in this instance ether was employed. The patient was a very fat woman, weighing more than 300 pounds. Operative interference was rendered necessary by the impaction of a breech presentation and death occurred during the extraction of the child. At autopsy no pathological lesion was demonstrable.

Ether was administered on account of the corpulence of the patient, as it was believed that it would be safer under the prevailing circumstances than chloroform which is used in this clinic almost without exception.

It is indeed notable that we have had no fatality from chloroform in these 5000 cases, although it is given as a matter of routine to every patient at the end of the second stage of labor and to the point of complete anæsthesia when the vulva is fully distended. Moreover it is employed in all operative deliveries, except occasionally in certain cases of Cæsarean section. Its relative safety in obstetrical practice is too well known to need more extended comment, although the endorsement afforded by this series of cases very well merits mention.

ABSTRACT OF HISTORIES.

Group I. Infections—21 Cases.

1. *House No. 261.* Symphysiotomy for contracted pelvis. Infection of incision and pelvic veins. Patient died suddenly a few minutes after dressing the vaginal wound, apparently of embolism, but this was not found at autopsy. *Autopsy No. 1139.* Necrosis and gangrene of wound. Extravasation of blood in pelvic fascia. Acute splenic tumor. Hypostatic congestion of lungs.

2. *House No. 372.* Patient admitted in consequence of a neglected brow presentation, having been under the care of a midwife and doctors who had attempted delivery. Examination showed a prolapsed cord and dead child. Delivery by craniotomy. Cultures taken at the time of operation showed pure streptococcus. Patient developed vesico-vaginal fistula, phlegmasia alba dolens, and ran a typical course of infection. She died suddenly of pulmonary embolism on the 27th day of the puerperium after the vaginal wound had been dressed. *Autopsy No. 1304.* Vesico-vaginal fistula resulting from pressure necrosis during labor. Pseudomembranous endometritis. White thrombosis of vesical veins, internal and common iliac veins, and of vena cava. Emboli in right pulmonary artery and pulmonary trunk, projecting into left pulmonary artery. Perforation of uterus. Localized peritonitis.

3. *House No. 571.* Eclampsia at six months. The patient had been examined several times before admission by a midwife and doctors. Cervical dilatation was begun by Champetier de Ribes balloon and completed by the Harris manual method. Patient ran a typical course of infection and died on the 11th day. *Autopsy No. 1484.* Endo- and parametritis. Septicæmia. Metastatic lung abscesses.

4. *House No. 582.* Patient admitted on the 23d day of the puerperium. Died the following day of ulcerative endocarditis. *Autopsy No. 1487.* Acute vegetative and ulcerative endocarditis, aortic, tricupsid, and pulmonary valves.

5. *House No. 921.* Patient was admitted when six months' pregnant. Had been sick with chills and fever for two weeks before admission. Had miscarriage several days after admission. Manual removal of placenta. Died three days later. *Autopsy No. 1763.* Pyonephrosis. Multiple pyæmic abscesses. General infection.

6. *House No. 1300.* Spontaneous delivery 11 days before admission. Attended by midwife. Death three days after admission from septicæmia. No autopsy.

7. *House No. 1311.* Patient admitted with infected abortion. Uterus cleaned out. Died on the 10th day of puerperium of peritonitis. *Autopsy No. 2024.* Abscess of left ovary. General fibro-purulent peritonitis. Fibro-purulent pleuritis, right. Metastatic abscesses in lung.

8. *House No. 1373.* Spontaneous delivery six days before admission. Attended by an outside doctor. Patient had general peritonitis on admission and died three days later. Laparotomy and enterostomy for distension. No autopsy.

9. *House No. 1531.* Patient admitted with infected abortion. Temperature became normal in about six days. Convalescence uneventful. On examination on the 16th day was found to be in good condition, but for small pelvic mass. Discharged. Returned two days later with general peritonitis. Operated upon, but died next day. No autopsy.

10. *House No. 1611.* Cæsarean section for contracted pelvis. Examined once. Symptoms of peritonitis developed on the third day, which were clearing up, when patient developed intestinal obstruction and died. *Autopsy No. 2209.* Infection of uterine wall with necrosis and abscess formation. General peritonitis.

11. *House No. 1700.* Delivered by the outpatient department. Two examinations with the usual technique. Child born half an hour after examinations. Three days later patient developed chills and fever. Died on the 16th day of the puerperium. *Autopsy No. 2236.* Puerperal infection of uterus. Infected thrombus of left ovarian vein. Localized peritonitis. Purulent arthritis of knees.

12. *House No. 1702.* Admitted with infected incomplete abortion. Died on the 18th day of pyæmia. *Autopsy No. 2260.* Thrombosis of vena cava, left common iliac vein, external and internal iliac, femoral and saphenous veins. Partial thrombosis of right common iliac vein. Embolic abscess in lung.

13. *House No. 1765.* Spontaneous delivery, attended by midwife. Admitted on the 15th day of puerperium for general septicæmia. Died next day. No autopsy.

14. *House No. 2052.* Patient was delivered by the outpatient department, but was not examined vaginally. Had had coitus at the onset of labor 16 hours before delivery. Developed infection and died of general peritonitis on the seventh day of the puerperium. *Autopsy No. 2457.* Infected puerperal uterus with multiple abscesses and gangrene of uterine wall. Acute fibro-purulent peritonitis.

15. *House No. 2103.* Admitted 12 days after an abortion. Septicæmia. Died six days later. No autopsy.

16. *House No. 2212.* Miscarriage. Manual removal of placenta by midwife. Admitted several days later for general peritonitis. Died 24 hours after admission. *Autopsy No. 2564.* Acute fibro-purulent peritonitis.

17. *Outpatient Department No. 56.* Physometra when seen. Delivered by craniotomy. Died on the third day from an infection with *B. œrogenes capsulatus* and streptococcus. No autopsy.

18. *Outpatient Department No. 210.* Patient had been examined several times by a midwife before department was called. Delivered by low forceps. Manual removal of placenta. Rupture of bicornute uterus. Patient refused to come to hospital for operation and died of peritonitis. *Autopsy.* General peritonitis and rupture of bicornute uterus.

19. *Outpatient Department No. 1221.* Spontaneous labor. Two examinations with the usual technique. Normal puerperium until the fifth day, when the temperature suddenly rose to 105° and the patient died 12 hours later. No autopsy.

20. *Outpatient Department No. 1574.* Child delivered normally. Manual removal of placenta. Patient died on the fourth day. Infection with *B. œrogenes capsulatus.* No autopsy.

21. *Outpatient Department No. 935.* Patient delivered by Cæsarean section in her home amid extremely dirty surroundings. The incision became infected and the patient died of pyæmia. No autopsy.

GROUP II. TOXÆMIAS—16 CASES.

(*A*) *Eclampsia—12 Cases.*

1. *House No. 27.* Patient admitted in deep coma, after having had 11 convulsions. The convulsions continued for 24 hours after delivery; the patient remained in deep coma and died on the fifth day. *Autopsy No. 912.* Acute and chronic nephritis. Acute degeneration, necroses and hæmorrhages in liver.

2. *House No. 322.* Patient had slight premonitory symptoms of eclampsia. Easy and spontaneous labor. First convulsion three hours after delivery. Seven convulsions in 18 hours. She then improved somewhat, but later passed into a semicomatose condition and died on the eighth day of the puerperium. *Autopsy No. 1218.* Acute parenchymatous nephritis. Multiple foci of necrosis in liver. Œdema of lungs.

3. *House No. 496.* Admitted with symptoms suggesting toxæmia of pregnancy. She was put upon treatment and the condition improved. Patient awakened one night complaining of intense headache. Shortly afterwards she had a convulsion. Delivery by accouchement forcé. Condition improved for several days, then began to grow worse. She passed into a semicomatose condition and died on the seventh day. No autopsy.

4. *House No. 787.* Eclampsia gravidarum. The patient had had several convulsions and was in deep coma on admission. Accouchement forcé. There were no convulsions after delivery, but the deep coma continued and death occurred eight hours after admission. *Autopsy No. 1637.* Acute nephritis, with fatty degeneration. Focal necrosis in liver about portal spaces. General œdema.

5. *House No. 795.* Profoundly comatose patient admitted in labor, with a history of having had three convulsions. She was delivered at once, but remained in coma and died six hours later. No autopsy.

6. *House No. 909.* Patient delivered spontaneously by the outpatient department, and had "several fits." She was seen at once and found to be in deep coma. She was brought to the hospital, but failed to regain consciousness or to respond to treatment and died two hours later. *Autopsy No. 1749.* Chronic nephritis. Hæmorrhages into the liver. Œdema of lungs.

7. *House No. 1176.* Eclampsia gravidarum. The patient had had two convulsions and was in deep coma on admission. She was delivered immediately. The convulsions continued throughout the night, followed by coma. Patient died 11 hours after admission. *Autopsy No. 1921.* Cloudy swelling of kidneys. Focal necrosis and hæmorrhage in liver. Œdema of lungs. Bronchitis and bronchopneumonia.

8. *House No. 1177.* The patient had slight symptoms of toxæmia on admission, but these cleared up under treatment and there were no further symptoms. During the second stage of labor a single convulsion occurred, followed by deep coma. Death in four hours. *Autopsy No. 1934.* Slight chronic interstitial nephritis and parenchymatous degeneration of liver. General anæmia.

9. *House No. 1243.* Eclampsia gravidarum. Patient admitted in deep coma, after having had four convulsions and having been delivered. She had four convulsions after admission, remained in deep coma, and died in 36 hours. No autopsy.

10. *House No. 1625.* Eclampsia gravidarum. The patient had had 11 convulsions, and was in deep coma when seen. She died three hours after admission. No autopsy.

11. *House No. 1722.* Patient admitted in deep coma at the eighth month of pregnancy, with the history of headache and œdema of legs. A few hours before admission she complained of severe headache and a few minutes later went into coma. There were no convulsions. This is a case of eclampsia without convulsions. *Autopsy No. 2265.* Pregnancy eight months. General œdema. Slight parenchymatous nephritis. Focal necroses and hæmorrhages in liver.

12. *Outpatient Department No. 442.* The patient was seen in deep coma by the outpatient department four hours after the child was born. There had been many convulsions before delivery. The family was urged to allow the patient to be taken to the hospital, but they refused. The patient then had several slight convulsions, remained in coma, and died 16 hours later. No autopsy.

(B) Nephritis—2 Cases.

1. *House No. 9.* Admitted in semicomatose condition. Urine showed traces of albumin, hyaline, and granular casts. On treatment, condition improved somewhat. Labor set in on the eighth day after admission. Second stage ended with forceps on account of uræmic symptoms. Patient remained in semicomatose condition and was taken home on the 32d day of the puerperium. Died 12 hours later. *Autopsy No. 483.* Chronic diffuse nephritis. Slight fatty degeneration of liver. No peripheral necrosis in liver.

2. *House No. 198.* Patient admitted with intense headache. This continued and patient seemed irrational at times. Delivery by accouchement forcé. Patient gradually became semiconscious and died 18th day after admission without convulsions. This is classed as a case of chronic nephritis. No autopsy.

(C) Vomiting—2 Cases.

1. *House No. 650.* Patient had been vomiting incessantly for three weeks before admission. Was then three months' pregnant. On admission her condition was bad. Pulse 120 to minute, general condition poor. Therapeutic abortion was done. The next day she became delirious and later went into coma. She died 48 hours after the uterus was emptied. *Autopsy No. 1551.* Fatty liver. Endometritis and puerperal uterus.

2. *House No. 2116.* Pernicious vomiting. The patient began to vomit when six weeks' pregnant and had been vomiting almost constantly for one month. High ammonia coefficient. Therapeutic abortion was done, but the patient continued to vomit and died two days later. No autopsy.

GROUP III. HÆMORRHAGE—8 CASES.

1. *House No. 460.* Patient was admitted with a history of having had profuse hæmorrhage the day before from placenta prævia. Her condition was extremely poor. Pulse varied from 150 to 170. Was delivered at once, with very little additional hæmorrhage, but died at the end of the operation. *Autopsy No. 1389.* Slight tear of cervix. Anæmia of viscera.

2. *House No. 694.* The patient had been in labor for over two days before admission. Numerous attempts made to deliver her, but these were unsuccessful, because of the generally contracted rachitic pelvis. There had been considerable bleeding from a lateral placenta prævia. Condition poor, pulse 150 and of poor quality. Examination showed a prolapsed cord and a dead child. Craniotomy. The patient did not bleed during the operation, but died a few minutes later. No autopsy.

3. *House No. 866.* Patient had been bleeding for 24 hours before being seen. The blood had soaked through the mattress and 700 or 800 cc. of clots were in the bed. She was brought at once to the hospital, in very poor condition, and delivered. There was very little hæmorrhage afterwards, but she failed to respond to stimulants and died several hours after admission. *Autopsy No. 1715.* Cervical laceration. Anæmia of all organs.

4. *House No. 1126.* Patient suffering from toxæmia. Delivered by accouchement forcé. She lost a large amount of blood during the operation, had a deep cervical tear and incomplete rupture of the uterus. This was sewed up and the uterus packed with gauze. Condition improved for a while after the operation, but then suddenly grew much worse; patient began to bleed and died while preparations were being made to control the hæmorrhage. In this case death was undoubtedly hastened by treatment. No autopsy.

5. *House No. 1297.* Placenta prævia. The patient was in good condition at the beginning of the operation. She was delivered by accouchement forcé. Rupture of lower uterine segment and excessive hæmorrhage. The patient died of hæmorrhage 12 hours after operation. *Autopsy No. 2004.* Rupture of lower uterine segment, cervix, and vagina, but not extending into peritoneal cavity. Hæmorrhage into periuterine tissues and uterus.

6. *House No. 1548.* Cæsarean section for contracted pelvis. The patient bled profusely while the child was being removed. The bleeding continued during the removal of the uterus and could not be controlled. Patient died from shock at the end of the operation. *Autopsy No. 2176.* General anæmia of organs. Congestion and œdema of lungs.

7. *Outpatient Department No. 1370.* The patient was delivered by breech extraction. The puerperium was normal until the third day, when the patient got out of bed and had a hæmorrhage. She notified the hospital. Her condition when seen was fair, with no bleeding. She was seen later in the day and there was no further hæmorrhage. The patient was strongly advised to enter hospital, but refused. On the morning of the fourth day she again got out of bed and hæmorrhage immediately began. When seen she was in extremis and died a few minutes later. *Autopsy No. 1704.* Bicornute uterus. Vaginal septum. Rupture of uterus and vagina extending into adjoining tissue. Slight subperitoneal and retroperitoneal hæmorrhage. Anæmia of tissues.

8. *House No. 2201.* The patient was sent to the hospital after several attempts to deliver her by two doctors at her home. Her condition on admission was very poor, the pulse being rapid and weak. The patient was very fat and an abdominal examination was unsatisfactory. Vaginal examination showed rupture through the posterior wall of the uterus. A foot of the child could be grasped and an attempt was made to extract it. This proved difficult and the patient died during the attempt. *Autopsy No. 2552.* Rupture of uterus. Hæmorrhage.

GROUP IV. MISCELLANEOUS—10 CASES.

1. *House No. 962.* The patient was delivered by low forceps. The temperature immediately after the operation was 101.6°, but it fell to normal in a few hours, and never went above 100.4° afterwards; pulse normal. The puerperium was considered normal in every way. Suddenly, on the 12th day of the puerperium, while the patient's breast was being massaged, she complained of pain in the side and difficulty in breathing. She died nine hours later from pulmonary embolism. *Autopsy No. 1801.* Thrombosis of vesical veins. Occlusion of external iliac veins. Embolism of pulmonary artery and conus arteriosus.

2. *House No. 1040.* The patient was extremely fat, weighing over 300 pounds. During the second stage of labor, she showed signs of beginning exhaustion, the pulse becoming rapid and poor in quality. She was anæsthetized with ether and delivered by an easy breech extraction. The patient collapsed at the end of the operation and died. This case is classed as due to "cardiac failure." *Autopsy No. 1850.* Chronic tuberculosis of lungs, with acute localized miliary tuberculosis. Extreme obesity. Considerable remains of thymus gland.

3. *House No. 1240.* The patient had been ill for one month before admission. She had a spontaneous easy labor five days later. Two days afterwards she died of amœbic dysentery. *Autopsy No. 1977.* Ulcerative colitis (amœbic). General fibro-purulent peritonitis. Fatty degeneration of heart, liver, and kidneys. Œdema and hypostatic congestion of lungs.

4. *House No. 1256.* Cæsarean section for contracted pelvis. The patient took anæsthesia poorly and was much shocked by the operation. There was marked abdominal distension and the bowels could not be made to move. The abdomen was opened, but there were no signs of peritonitis and no definite obstruction. The small intestine was greatly distended. Many round worms could be felt in the intestines. An enterostomy was done and several round worms removed. Some gas was passed. The patient was much shocked and died a few hours later, apparently of intestinal paralysis. No autopsy.

5. *House No. 1294.* The patient, eight months' pregnant, was admitted with broken cardiac compensation and pneumonia. Patient died the next day without going into labor. No autopsy.

6. *House No. 1499.* Throughout pregnancy the patient had worn an extremely tight abdominal binding to conceal her condition. She was admitted suffering from nausea and vomiting and swelling of left leg. Her bowels had not moved for six days before admission. There was extreme œdema of the left leg. Labor was induced and delivery completed by version and extraction. The patient died 10 hours later, apparently of shock. *Autopsy No. 2121.* Thrombosis of left common iliac vein. Œdema of lungs. Arteriosclerosis.

7. *House No. 1662.* Patient had fever for nine days before delivery. Spontaneous and easy labor. Died on the 21st day of the puerperium from typhoid fever. *Autopsy No. 2252.* Healing typhoid ulcers in small intestine. Œdema and atalectasis of lungs. Bronchopneumonia. Acute spleen tumor.

8. *House No. 2158.* Cæsarean section for contracted pelvis. The patient developed intestinal obstruction from a loop of gut becoming adherent to the abdominal incision. A second operation was done and the loop freed, but the patient did not rally. *Autopsy No. 2566.* Operation wound. Laparotomy. Meteorism. Slight localized fibrinous peritonitis. Rachitic changes in bones of pelvis, legs, and ribs.

9. *House No. 2181.* Patient at term admitted to the ward in the afternoon with extreme dyspnœa, which had existed for four days. Had marked exophthalmos, enlarged thyroid, and rapid pulse. She was put to bed and seemed fairly comfortable, until about 11 p. m., when labor pains began. The child was born one hour later, apparently with a very easy labor. Immediately afterwards, before the placenta was delivered, the patient collapsed and died almost instantly. No autopsy.

10. *House No. 2229.* The patient was delivered by an extremely difficult version and extraction. The difficulty was due to a generally contracted pelvis. The morning after the operation the patient's condition was quite good, but for some abdominal distension. This increased during the day and the bowels could not be moved. Suddenly the patient became dyspnœic and the pulse became very poor and irregular. The patient died in about half an hour, 36 hours after delivery. *Autopsy No. 2587.* A loop of gut was adherent to the left horn of the uterus, and the change in the size of the uterus after delivery had caused an acute kink. Cardiac dilatation and hypertrophy. Fibrous myocarditis.

SUMMARY.

1. There were 55 maternal deaths in the 5000 cases, representing a gross mortality of 1.1%.

2. The fatalities are divided into the following groups:

Etiology.	Number of Deaths.	Gross Mortality.	Proportion of all Deaths.
I. Infections	21	0.42%	38.18%
II. Toxæmias	16	0.32%	29.09%
III. Hæmorrhages	8	0.16%	14.54%
IV. Miscellaneous	10	0.20%	18.18%

3. In Group I, 12 cases were infected before admission to the department. One patient had coitus during labor and was not examined by vagina. In two others midwives had made repeated vaginal examinations. Thus, six cases remain in which the department was responsible for the fatal infection, representing a mortality of one-eighth of one per cent.

4. In Group II there were 16 deaths, divided as follows: Eclampsia, 12; nephritis, 2; toxæmic vomiting of pregnancy, 2. The mortality from Eclampsia was 25%, which should be considered very favorable in view of the fact that the majority of the cases were admitted in coma.

5. In Group III there were eight deaths. Four of these were due to placenta prævia, and in three of them the patient was moribund on admission. In the fourth case death resulted from incomplete rupture of the uterus due to manual dilatation of the cervix. The dangers incident to accouchment forcé in this condition make it less preferable than the employment of a slower method of cervical dilatation such as the inflated rubber bag.

The remaining four deaths from hæmorrhage were associated with rupture of the uterus in three cases and with Porro Cæsarean section once.

6. In Group IV there were 10 deaths, distributed as follows:

Intestinal obstruction	3	Thrombosis	1
Typhoid fever	1	Embolism	1
Pneumonia	1	Exophthalmic goitre	1
Amœbic dysentery	1	Anæsthesia	1

NOTES ON NEW BOOKS.

A Text-Book of Obstetrics. By Barton Cooke Hirst, M. D., Professor of Obstetrics in the University of Pennsylvania, etc. 5th edition. (*Philadelphia and London: W B. Saunders Company, 1906.*)

The author has had an unusually large experience in practical obstetrics and it is this material which supplies the basis of his book. Much of the text is taken up with a consideration of his own cases and many of the illustrations are photographs from them. The conclusions which he has reached from his clinical observations relative to causation and treatment are often at variance with modern opinion. Thus, his advocacy of the doctrine of maternal impressions is quite out of sympathy with the established facts of embryology.

In general, the teaching presented in this edition is unaltered from that of its predecessors. Eclampsia is still considered amenable to veratrum viride. Puerperal infection is said to call for first of all a thorough but careful curettage of the uterus. The Bossi dilator is recommended as a safe instrument where immediate delivery is required in the presence of an unyielding cervix. All these are measures in some dispute yet with the weight of authority opposed to the advice given in this volume.

The more recent advances in obstetrics are slightingly treated or positively condemned. Vaginal cæsarean section is thought to have an extremely limited field of usefulness, and pubiotomy none at all. No progress is admitted relative to our knowledge of toxæmia during pregnancy. The contributions of Breus and Kolisko to the pathology of the rachitic pelvis receive no mention.

So far as one may judge from the opinions expressed by the author, this branch of medicine has seen no advance since the appearance of his last edition.

The Technique of Vagino-Peritoneal Operations. By E. Wertheim and Th. Micholitsch. Translated into English by Cuthbert Lockyer. With 138 illustrations. (*London: Macmillan & Co., Limited, 1907.*)

In German clinics the vaginal route for pelvic operations is employed much more frequently than it is in America. The Germans have developed this method of operating for pelvic disease and are thoroughly familiar with its technique and its possibilities. In their hands the operations are safe and satisfactory. It would be well for American surgeons to become more familiar with the technique of the vagino-peritoneal route. For this purpose no better book could be obtained than that published a year ago by Prof. Wertheim and Dr. Micholitsch and now translated into English by Cuthbert Lockyer. There is but little text—just enough to give an outline of the technique and an accurate description of the plates which illustrate the different steps in the various pelvic operations. The plates, which are full page and made from actual photographs, are clear and need but little description.

The book is intended for the surgeon who is beginning to do pelvic operations by the vaginal route, and the plates illustrate clearly the fundamental principles in this work, without going into the details which the surgeon is supposed to know. The book should be received well by American surgeons and prove a great help in simplifying pelvic work.

Gynecology and Abdominal Surgery. Edited by Howard A. Kelly, M. D., F. R. C. S. (Hon. Edin.), and Charles P. Noble, M. D. Volume I. (*Philadelphia and London: W. B. Saunders Company, 1907.*)

The publication of a comprehensive work which includes both Gynecology and Abdominal Surgery, two subjects which have become closely related to and dependent upon each other, especially in the last few years, surely must meet with the approval of the general surgeon and progressive gynecologist alike.

"Gynecology and Abdominal Surgery," in two volumes, edited by Dr. Kelly and Dr. Noble, the first volume of which has lately appeared, is, if one may judge from a review of this volume, a broad, comprehensive presentation of these two subjects.

Volume I is devoted entirely to gynecology, and the different subjects are presented by men who are leaders in gynecological work in this country. Each division of gynecological work has been treated in the fullest possible manner, thereby making the book acceptable not only to the student but to the practitioner and surgeon also. It is hardly necessary to review the separate chapters in detail, a glance at their authorship being sufficient guarantee of the thoroughness and quality of their contents.

Especial mention may be made, however, of the chapters on Bacteriology and Pathology. It is a great satisfaction at last to have a book which contains a thorough and scientific presentation of the Bacteriology and Pathology of gynecological diseases. These two chapters are excellent and will commend themselves to every student. The chapter on Pathology is an especially comprehensive and clear presentation of that most important and necessary branch of Gynecology.

Chapter 4 is a treatise on Medical Gynecology, intended chiefly for the general practitioner. The treatment of pelvic disease has become to such a large extent operative that the caution contained in this chapter against too much operating is a necessary one. Some of the treatments advised, however, are rather antiquated, and if carried out by a practitioner with but little skill and still further disregard of antiseptic precautions, would be the cause of much serious trouble. This is especially true of intrauterine applications, electricity, tampons, etc.

The illustrations are excellent throughout, clear and truly illustrative of the text. Mr. Brödel's and Mr. Becker's work is well known and stands for the highest in art as applied to medicine.

The volume is well indexed. The bibliography is not an important feature, but such a work scarcely calls for an extended bibliography.

The appearance of the second volume, on abdominal surgery, will complete a most valuable work on regional surgery.

A Manual of the Practice of Medicine, Prepared Especially for Students. By A. A. Stevens, A. M., M. D., Professor of Therapeutics and Clinical Medicine in the Woman's Medical College of Pennsylvania, etc. 8th edition, revised. Illustrated. (*Philadelphia and London: W. B. Saunders Company, 1907.*)

The sixth edition of this book was reviewed in the Bulletin in 1904. The present edition has been thoroughly revised and enlarged, and the section on diseases of the nervous system has been rewritten. The work of compressing the essentials of the practice of medicine into a volume of less than 600 medium-sized pages has been difficult, but there has been no sacrifice of clearness of description. It is, however, valuable chiefly as a manual for students about to pass examinations, rather than as a treatise on medicine.

The Consumptive Working Man—What Can Sanatoria Do For Him? By Noel Dean Bardswell, M. D., M. R. C. P., F. R. S. (Edin.), Medical Superintendent King Edward VII Sanatorium. 202 pages. (*London: The Scientific Press Limited, 1906.*)

No book which has recently appeared upon the subject of sanatorium care of the working classes deserves a wider reading, a more careful consideration, than this little one of Dr. Bardswell. The question has often been raised, are the conditions of

life of the poor such that it is economical for the state or the community to spend their money in the endeavor to cure men and women whose home surroundings, employment, income, etc., are so unfavorable to the attainment of perfect and continued cures?

In other words, did the sanatorium after the expenditure of all its energies merely effect temporary relief for working men who, on return to their homes and to wage-earning employments, were so likely to suffer a relapse of their disease that the original expenditure was unprofitable from the side of pure economies? In this consideration all calls of philanthropy are necessarily left out of account. It is to the answer of this question, so important in its bearing when states, municipalities, or communities are appealed to for support of sanatoria that Dr. Bardswell devotes his pages.

In order to make his study complete and convincing he undertakes the full investigation of but a limited number of cases, yet this investigation is so thorough, so comprehensive, so typical of what would be expected however many cases were considered, that the conclusions seem to bear the weight of full authority. Moreover, these conclusions, compared statistically with much larger reports, are found to stand relatively correct. We should, therefore, consider his answer as final and satisfactory, viz., that with all forces at our command working together in harmony, there can be no doubt that it is profitable to undertake the sanatorium care of incipient cases of tuberculosis among the working classes with the expectation that such a proportion of them will be permanently cured that the value to the state of the lives saved much more than overbalances the expenditure made. But to insure these results the co-operating forces above alluded to must be present and effective; means of early diagnosis, such as is provided by tuberculosis dispensaries, means of providing for families in the absence of its head, such aid as is furnished by charity organization workers or relief associations, committees for the after-care of consumptives, finding suitable employment, etc., and the establishment of farm colonies where those not wholly fitted at once to return to former employment may be given work under the most favorable conditions.

Aside from the economic value of the sanatorium, Dr. Bardswell very aptly refers briefly to its philanthropic value, quoting Sir Douglas Powell, "we must remember that relief of symptomatic suffering is one of the highest functions of such institutions."

The volume is small, well printed, easily read, and I recommend it thoroughly to all sanatorium managers for its inspiration and valuable suggestions, and to all others interested in providing relief to suffering consumptives for its hopefulness and assistance.

H. B. J.

A Text-Book of Physiology for Medical Students and Physicians. By WILLIAM H. HOWELL, PH. D., M. D., LL. D., Professor of Physiology in the Johns Hopkins University, Baltimore. Second edition, thoroughly revised. (*Philadelphia and London: W. B. Saunders Company, 1907.*)

Dr. Welch remarked some years ago that it had been his experience if a physician was found chasing some will-of-the-wisp it was almost invariably one whose knowledge of physiology was very deficient. This is probably still more true at the present time when physicians are looking upon disease more and more from the physiological point of view. Numerous references occur in the current medical literature to systolic and diastolic arterial pressure, to pulse pressure, to heart-block, to the metabolism of the purins, to the rôle of internal secretions, etc. Many new and wonderful agencies for the regulation of processes of secretion and growth—such as the hormones concerned in the secretion of the gastric and pancreatic juices, those concerned in the growth of the mammary gland, etc.—are being discovered. Apparatus which was formerly strictly confined to the physiological laboratory—kymographs, tambours, blood-pressure apparatus, etc.—are now found in the hospital wards; even the galvanometer has been proposed as a measurer of the emotions in psychiatry. Manufacturers of drugs, ferments, etc., are urging the physician to take advantage of recent advances in physiology and prescribe their preparations of "granules of the kidney," of the Isles of Langerhans, etc. In some cases these preparations and their method of exploitation smack so plainly of humbuggery that only the most credulous are deceived. But as the mechanisms by which the processes of the body are regulated are gradually understood and as it becomes more and more evident that some of these may be influenced by diet, drugs, and other means, it becomes increasingly difficult for the practicing physician to avoid, on the one hand, failing to make use of these discoveries in diagnosis and treatment and, on the other hand, of becoming the dupe of ignorant or dishonest manufacturers; that the graduates of even the best medical schools too often go to the one or the other extreme is well known. Thus it is undeniable that many physicians after they leave the medical school act consciously or unconsciously upon the "physiology" they learn from trade circulars or "write-ups" (often skilfully disguised) which unfortunately are too often found in the reading columns of medical journals of influence.

The above illustrations indicate how desirable it is for physicians to have some recent trustworthy work on physiology which they can frequently consult. The title page of Howell's Physiology states that it is a text-book "for medical students and physicians." It is from the latter standpoint that it seems desirable to discuss this volume at the present time. The admirable features of the work from the standpoint of the medical student and the general scope of the book were discussed in these columns when the first edition appeared and need not be repeated. It was predicted at that time that this would become the leading text-book of physiology in English-speaking countries. This prediction seems to have been fulfilled. A few teachers have stated that the work is too advanced for their students; a few others that it is too elementary. The truth is probably that the author, who is such a successful and experienced teacher, has come as near meeting the needs of the better medical students as it is possible for any one to do. It would certainly seem that a medical school whose students are not prepared to use such a work as this or which cannot devote sufficient time to cover it satisfactorily has little excuse for existence.

A similarly favorable opinion can be given of the work from the standpoint of an advanced student or physician. Although most text-books on this subject claim to be "for medical students and physicians" a very little examination usually shows that the authors or publishers have little realization of what a book making this claim should be. A physician may recognize the desirability of occasionally reviewing the old well-established facts of physiology, yet as a matter of fact when he goes to a new book it is usually for information on a specific subject. He then desires the latest views, although they are often contradictory, and seeks especially references which will enable him to quickly find the more important original articles. A person seeking such information must find most of the present text-books very unsatisfactory. Some contain no references to the literature whatever. Others dismiss subjects still under discussion with scarcely a word; one of the recent works, for example, states that the parathyroids have at present only an anatomical interest. It seems to the reviewer that the present work more nearly deserves the title for "medical students and physicians" than any of the others with which he is acquainted, although from the tone of the author's preface (in which he explains why subjects still in controversy are included) it would seem that he was thinking of the medical student much more than of the physician when he wrote it. Perhaps it was the publisher rather than the author who added the "for the physician." Neverthe-

less, it is believed that the physician can nowhere find a clearer and more succinct account of the present status of physiology than here; most physicians would undoubtedly be surprised to see how antiquated much of their knowledge of the subject is.

The second desideratum of a book for advanced students—carefully selected references to the literature—has been met in this book better than in most text-books. It would obviously be impracticable to attempt to give references to even the most important original articles in a book designated as a text-book; the best that an author can do is, as Howell states, to cite "those works which themselves contain a more or less extensive discussion and literature." Howell refers frequently to Nagel's *Handbuch*, Schäfer's text-book, the *Ergebnisse der Physiologie*, and a few monographs as well as to extensive articles in current, especially physiological, journals. It seems to the reviewer that the value of the work could have been very considerably increased with but little increase in size by including references to the splendid *Sammelreferate* which so frequently appear in the *Biochemisches Centralblatt* and *Zentralblatt für die gesammte Physiologie und Pathologie des Stoffwechsels* and to the articles on special topics in physiology to be found in many of the large treatises on practice, obstetrics, neurology, urology, diseases of children, of the eye, etc. Perhaps a few more references to pathology and pharmacology could have profitably been introduced. Thus, as is evident from the brief account in this book, practically nothing is known about the physiology of the thymus; a little is known concerning its condition in certain pathological states and it seems not improbable that hints as to the function of this organ will come from the latter rather than from purely physiological studies. The conceptions of heart-block and dissociation of auricular and ventricular rhythm have played a prominent part in the pharmacology of digitalis for many years and could well be used to further illustrate what is said concerning the conduction of impulses in the heart. The extent to which subjects bearing upon cognate branches of medicine can be profitably introduced into a work on physiology is, however, very limited. As the author remarks in the preface, "it is the main duty of the physiologist to till his own field." The attempts to write "practical" text-books on physiology, "to bridge the space between theory and practice," etc., usually result in the production of most impracticable and unsatisfactory works.

Physiology is advancing so rapidly that frequent revisions of such a book as the present one will be necessary to keep it abreast of the times. This will require much time and labor, and to a physiologist like Howell, who is so successful an investigator as well as teacher, this may at times become irksome, but he should have the satisfaction of feeling that he is rendering a service of the greatest value to the entire medical profession.

R. H.

A Text-Book of Practical Diagnosis. The Use of Symptoms in the Diagnosis of Disease. By Hobart Amory Hare, M. D., Professor of Therapeutics in the Jefferson Medical College of Philadelphia. New (6th) edition, thoroughly revised and rewritten. Octavo, 616 pages, with 203 engravings and 16 full-page plates. (*Philadelphia and New York: Lea Brothers & Co., 1907.*)

The present (sixth) edition of Hare's Diagnosis needs no extensive review, as the work is so well known. What was said of the fifth edition applies equally to the present volume. The sections dealing with the blood, urine, etc., are, we believe, too abbreviated to be of great value. This, however, is a natural fault, since it is manifestly impossible to present in a few chapters an adequate treatment of a subject, such as laboratory diagnosis. Another criticism we make is the sparing use of the Röntgen ray as an aid in diagnosis. In the differential diagnosis between aneurism of the thoracic aorta and mediastinal growths the fluoroscopic examination is at times the only means by which the true nature of the condition can be determined, yet we find no reference to such examination in the text; so, too, in the diagnosis of renal calculus, no mention is made of radiographic plates.

Common Diseases of the Eye. By Casey A. Wood, M. D., and Thomas A. Woodruff, M. D. (*Chicago: W. T. Keener & Co., 1907.*)

The only claim a book of this title would have for commendation would be due to an excellent arrangement of suitable subject-matter, and the precise consideration of those parts of ophthalmology of especial interest to the general practitioner. This book contains some very good paragraphs on the routine examination of the eye, and on the commoner injuries of the eye, and an excellent chapter dealing with the relationship between pathogenic conditions of the frontal, ethymoidal, sphenoidal, and superior maxillary sinuses to diseases of the eye. The major part of the book, however, is made up of subject-matter which is not especially well presented for the needs of the practitioner of general medicine. It has the fault of recommending at random a number of therapeutic measures for the treatment of the various eye diseases, instead of emphasizing certain tried therapeutic measures which have been found to give the best results.

We are sorry to see that the authors advise the instillation of eye-drops in these words, "single drops are instilled with best results by forming a drop at the end of the pipette and simply touching the edge of either lid with it." Of course the eye-dropper should never touch the lid; for, unless the dropper were sterilized after each application the whole solution from which the drop was taken would be contaminated.

The authors insert several formulæ for collyria for the relief of "ocular" headaches which would seem superfluous. [What do the authors mean by the following paragraph, p. 474: "It should be borne in mind that any departure from health may affect the eye so act as a predisposing cause of *ocular* headache. Prominent among the conditions that intensify or invite *ocular* headache are insomnia, whatever be its origin, etc."?]

The chapters on ophthalmology in its relationship with general medicine have not been written with the care which should have been bestowed on them. We take exception to the statements "that there are *few* general diseases which do not sooner or later affect some part of the visual apparatus" and that "simple anæmia and chlorosis (p. 457) are almost always associated with insufficiency of accommodation." Again, the eye signs found in hysteria instead of being frequent as one would believe from this book, are infrequently met with.

Attention is called to the fact that the page number as given in the table of contents does not always correspond to the text.

B. B. B. N.

Surgical Applied Anatomy. By Sir Frederick Treves, Bart., G. C. V. O., C. B., LL. D., F. R. C. S., etc. Fifth edition. Revised by Arthur Keith, M. D., F. R. C. S. Illustrated with 107 figures, including 41 in colors. (*Philadelphia: Lea Brothers & Co., 1907.*)

The appearance of the fifth edition of this manual since 1883 is a good indication of its popularity. In order to better determine its value to the student body among whom it has undoubtedly received its most cordial welcome the writer has made inquiries as to its practical use among students in the surgical courses at the Johns Hopkins University. To these it is evidently a most handy, rapid-reference book for surgical clinics and ward rounds. The index is well arranged and complete, the text is clear and concise, and the majority of the illustrations really illustrate. The addition of colors to this last edition is in many

instances of distinct value, but there seems a desire on the part of the publishers to use colored inks wherever possible. The best type of illustration is one where different tissues and structures are clearly contrasted by proper shading which makes clear the characteristics of each, and colors need be resorted to only in those in which there is danger of misinterpretation on account of the number of different structures involved. An example of an unnecessary use of color is found in figure 10 (page 38) which is intended to show the relation of the brain and sensorimotor areas to the skull. Here the two colors, lavender and red, really detract from the value of the illustration, as can be readily seen by referring to Quain's anatomy, from which it has been modified. Figure 12 and several others also show an unrestrained desire for unnecessary color. An inconsistency in the use of color is manifested on pages 106 (figure 23) and 114 (figure 24). In the first of these illustrations red lines are used, in the second where there is a similar necessity to outline areas, only black lines are resorted to. In either drawing black would be sufficient. This gives one the impression that much of this coloring has been introduced more to make the new edition attractive rather than to aid the student. However, figures 13, 16, and others are greatly benefited by the addition of color.

In comparing the illustrations of this last edition with those of previous editions a decided improvement is noted, and since the first publication in 1883 the number has almost doubled. Also, the text has been markedly revised, and since that time more than one hundred pages have been added, although the size of the book has not increased. That the book still remains so compact and so clearly printed is due to the thin but perfectly opaque paper on which it is printed and to the excellent typography. These, after all, are somewhat minor points. The text is what should be most carefully considered.

Throughout the entire book the statements are concise and properly grouped and at the end are thoroughly indexed. A very commendable feature in such a book is the manner in which important subjects are emphasized by italics or heavy-faced type. As a result it is not necessary to read through several pages in order to find the anatomy or the surgical relations of a certain organ or structure. Also brief outlines of many well-known surgical operations are given in connection with the anatomical description. Frequently, also, the name of the originator of the operation is noted and the description of the procedures, which, although inadequate for an operator, greatly assist the student in understanding and following operations. The book is in no way intended to replace exhaustive treatises and systems on the many branches of surgery such as those by von Bergmann, Keen, Da Costa, Stimson, Kelly, Cullen, and others. In this it differs materially from the many compends on medical sciences the intention of which is evidently to quickly assure a student that the superficial information therein contained is all that is known on that particular subject. Its field, as was before mentioned, is to aid students in understanding and intelligently following ward examinations and operations, and it is the key to more exhaustive studies. As such an aid it is, in its present revision, probably the best manual of applied anatomy at present before the medical profession.

EBEN C. HILL.

Syphilis In The Army. By MAJOR H. C. FRENCH, Royal Army Medical Corps, etc. (*London: John Bale, Sons & Danielsson, Ltd., 1907.*)

In this report the author has attempted "to show the detailed working of a preventive medicine problem in the army [English]." It is valuable and is of especial interest to army doctors. The conditions existing in the English army, which is scattered over the world, are so different from those of any other army that a detailed review of this work is useless. It should be read and studied, for only in this way can the problem of the prevalence of venereal disease in the English army be readily comprehended. It is a question of vital importance to us to-day, since we have distant colonies to which we send our troops, and to our medical corps this work should prove helpful. R. N.

The Life of Nathan Smith Davis, A. M., M. D., LL. D., 1817-1904. By I. N. DANFORTH, A. M., M. D., Chicago. Illustrated. (*Chicago: Cleveland Press, 1907.*)

The late Dr. N. S. Davis was an earnest, forceful, and, within rather narrow limits, a versatile man. He was a Sunday School teacher, a temperance lecturer, an able political speaker on occasion, an assiduous medical editor and author, an impressive medical teacher, a renowned physician, and a public spirited citizen. During his long life of public activity he impressed himself strongly upon the medical profession of America by reason of his strong convictions as to the necessity of organization on the part of physicians to enable them to exert their proper influence upon public opinion to secure necessary health and economic reforms. He was a clear thinker and tireless worker, and during his career he accomplished much to improve medical teaching in the Middle West. His name will also be honorably associated with the foundation and subsequent development of the American Medical Association for many years to come. The story of his life has been written by a devoted, loyal friend, to whom the task has been a labor of love. Those who knew Dr. Davis personally (and who did not?) will read with much gratification and profit this story of his life.

The Physician's Visiting List for 1908. (*Philadelphia: P. Blakiston's Son & Co.*)

That the publishers have met with success in this pocket notebook is evident from the fact that this is its fifty-seventh year of publication. The book is well arranged for the recording of visits, and is supplemented by various useful tables on poisons and their antidotes, dosage, incompatability, etc. It is light and of convenient size, and will be of service to any busy practitioner. R. N.

Cutaneous Therapeutics. By W. H. HARDAWAY, M. D., LL. D., and JOSEPH GRINDON, PH. B., M. D. (*Philadelphia: Lea Brothers & Co., 1907.*)

This book is based upon the descriptive and therapeutic sections of Hardaway's "Manual of Skin Diseases." In this new product of joint authorship, the descriptions of the various diseases, and general and medicinal treatment have been written by Hardaway; and Grindon has prepared the parts dealing with electrical and surgical treatment.

The authors have omitted all reference to the principles underlying dermatology, though they are intimately connected with rational treatment. However, a section on general treatment and methods, which is very good, fills about 100 pages at the back of the book.

A short description is given of each disease and sometimes its etiology is mentioned. Under differential diagnosis only the names of the diseases to be eliminated are told without any of their characteristics. Treatment is about as one finds in the best text-books and no more. Occasionally one finds suggestions at variance with his own experience; for instance, the authors advise not going above five drops dosage with Fowler's solution; again, one prescription calls for an ointment of chrysarobin 20 per cent strength, which is much too strong to start with, and which few skins can stand at any time.

It is hard to imagine why no illustrations are in the book. They are certainly necessary to help a physician make a diag-

nosis, and a correct diagnosis is essential for successful treatment. If 75 or 100 well-selected photographs of common skin diseases were added it would make the book a more valuable addition to our literature.

Elements of Physics for Medical Students. By Frederic James M. Page, B. Sc., F. I. C., etc. (*Chicago: W. T. Keener & Co., 1907.*)

In his preface the author states that his object is to supply a book which shall cover what is required in the examinations of the Conjoint Board and the Society of Apothecaries, and also emphasize those branches of physics which are of most use to the apothecary and the physician. The difficulty in preparing a book of this kind consists not only in making the proper selection of topics, but also in arranging and treating them so as to produce a connected whole and not merely a more or less disconnected collection of facts. The author has succeeded remarkably well, the chapters dealing with heat and electricity being especially interesting.

All demonstrations and explanations are simple and brief, but generally as accurate as can well be expected in a book of this kind; the numerous illustrations and diagrams are instructive.

An error, not included in the "Errata," was noticed on page 206, line 3 from top, where "two-fifths" should be substituted for "three-fifths."

A well-selected list of some hundred instructive laboratory experiments forms the last part of the book.

J. A. Anderson.

NOTES AND NEWS.

Dr. F. C. Ainley is assisting Dr. Hunter Robb in the Lakeside Hospital, Cleveland, Ohio.

Dr. John S. Billings, Jr., is Assistant Medical Director of the Department of Infectious Diseases of the Board of Health, New York City. His address is 32 East 53d Street, New York.

Dr. George Blumer is Attending Physician to the New Haven Hospital and Dispensary, and Consulting Physician to the Middlesex Hospital, Middletown, Conn. Address: 204 York Street, New Haven, Conn.

Dr. Walter V. Brem is Chief of the Medical Clinic, Colon Hospital, Cristobal, C. Z.

Dr. Clinton E. Brush is Associate Professor of Medicine and Instructor in Clinical Microscopy, University of Nashville Medical School; Pathologist to the Nashville City Hospital and The Woman's Hospital of the State of Tennessee. Address: 118 Eighth Avenue, North, Nashville, Tenn.

Dr. John G. Clark is Professor of Gynæcology, University of Pennsylvania; Consultant Gynæcologist to the Bryn Mawr Woman's, Germantown, Chestnut Hill, and Phœnixville Hospitals; Chairman of the Board of Public Instruction on Medical Subjects of the American Medical Association; Chairman Section on Gynæcology, College of Physicians, Philadelphia.

Dr. T. Wood Clark is Fellow of the Rockefeller Institute for Medical Research, and Acting Clinical Assistant, Children's Department, Vanderbilt Clinic. His address is 157 West 80th Street, New York City.

Dr. Malvern B. Clopton is Instructor in Surgery at the Washington University, St. Louis, and Visiting Surgeon to the St. Louis Hospital and St. Luke's Hospital. His address is Humboldt Building, St. Louis, Mo.

Dr. Marshall Fabyan is Assistant in Comparative Pathology, Harvard University. His address is Warren Street, Brookline, Mass.

Dr. Frederick R. Ford is Visiting Surgeon and Pathologist to St. Luke's Hospital, Utica. His address is 37-38 Clarendon Building, Utica, N. Y.

Dr. H. Z. Giffin is Attending Physician to St. Mary's Hospital, Rochester, Minn. Address: Masonic Temple, Rochester, Minn.

Dr. Campbell P. Howard is Demonstrator in Clinical Medicine and Clinical Chemistry, McGill University; and Physician to the Medical Outpatient Department and Assistant to the Children's Clinic, Montreal General Hospital. His address is 56 Mackay Street, Montreal, Canada.

Dr. Clarence B. Ingraham, Jr., is Assistant Physician to Dr. Howard A. Kelly's Sanitarium, 1418 Eutaw Place, Baltimore.

Dr. Harry T. Marshall is Professor of Pathology and Bacteriology, Philippine Medical School, Manilla, P. I.

Dr. R. T. Miller, Jr., is Resident Surgeon, The Johns Hopkins Hospital.

Dr. Roger S. Morris is Assistant in Medicine in the Clinical Laboratory of the Johns Hopkins Medical School. His address is The Arundel, Baltimore.

Dr. Rupert Norton is Assistant Superintendent, The Johns Hopkins Hospital.

Dr. Eugene L. Opie is Assistant in the Department of Pathology and Bacteriology, The Rockefeller Institute for Medical Research; Visiting Pathologist to the Presbyterian Hospital, New York, and Co-editor of the Journal of Experimental Medicine.

Dr. Lindsay Peters is in charge of the Medical Department of the Bolivia Railroad. His address is La Paz, Bolivia.

Dr. Jewett V. Reed is Consulting Surgeon to the Eleanor Hospital for Children, Director of the Laboratory of Neurology and Surgical Pathology, Indiana Medical College, and Visiting Clinical Surgeon, Indianapolis City Hospital.

Dr. F. Peyton Rous is Instructor in Pathology, University of Michigan.

Dr. Maurice Rubel is Attending Physician to the Michael Reese Hospital, Chicago, Ill.

Dr. Stephen Rushmore is House Physician to the Boston Lying-In Hospital.

Dr. Georgiana Sands is Visiting Physician to the Port Chester Hospital, Port Chester, N. Y.

Dr. W. F. M. Sowers is Assistant Professor of Surgery in the George Washington University. His address is 1707 Massachusetts Avenue, Washington, D. C.

Dr. Walter R. Steiner is Consulting Physician to the Middlesex Hospital, Middletown, Conn.

Dr. Hugh A. Stewart is Assistant Resident Physician, The Johns Hopkins Hospital.

Dr. Harvey B. Stone is Adjunct Professor of Surgery, University of Virginia.

Dr. Henry J. Storrs is Resident Obstetrician, The Johns Hopkins Hospital.

Dr. R. P. Strong is Professor of Tropical Medicine, Philippine Medical School, and Chief of the Biological Laboratory, Manilla, P. I.

Dr. J. H. J. Upham is Associate Professor of Medicine in the Starling Ohio Medical College, Columbus, Ohio, and Managing Editor of the Ohio State Medical Journal.

Dr. Frank Watson is Visiting Physician to the Charity Hospital, Lecturer and Instructor in Medicine, Tulane University, and Vice-President, Southern Branch American Medical Association. His address is 724 Baronne Street, New Orleans, La.

Dr. Stephen H. Watts is Professor of Surgery in the University of Virginia, and Director of the University of Virginia Hospital. His address is Charlottesville, Va.

Dr. Edward Werckmeister, Assistant Resident Surgeon, 1894-1895, is Director of the Sanatorium "Villa Quisiana," Hasserode i. Harz, Germany.

Dr. George H. Whipple is Pathologist to the Ancon Hospital, Ancon, Panama.

Dr. Harry I. Wiel is Clinical Assistant in Medicine and Instructor in Physical Diagnosis, Cooper Medical College. His address is 943 Van Ness Avenue, San Francisco, Cal.

Dr. Otis B. Wright is Clinical Lecturer in Surgery, University of Oregon Medical Department, Attending Physician to the Free Dispensary, University of Oregon, and Attending Physician to the Day Nursery, Portland, Oregon.

Dr. J. Whitridge Williams has been appointed Director of the Johns Hopkins Hospital Dispensary.

Dr. Paul G. Woolley is Chief Medical Inspector and Medical Adviser to the Kingdom of Siam. His address is Government Serum Laboratories, Phrapatoom, Siam.

Dr. Sarah D. Wyckoff is Attending Physician at the State Dispensary for Treatment and Prevention of Tuberculosis, Wilkesbarre, Penna.

RESOLUTIONS ADOPTED BY THE EXECUTIVE COMMITTEE OF THE AMERICAN NATIONAL RED CROSS, OCTOBER 18, 1907.

WHEREAS, By international agreement in the Treaty of Geneva, 1864, and the revised Treaty of Geneva, 1906, "the emblem of the Red Cross on a white ground and the words Red Cross or Geneva Cross" were adopted to designate the personnel protected by this Convention, and

WHEREAS, The Treaty further provides (Article 23) that "the emblem of the Red Cross on a white ground and the words Red Cross or Geneva Cross can only be used whether in time of peace or war, to protect or designate sanitary formations and establishments, the personnel and materiel protected by this Convention," and

WHEREAS, The American National Red Cross comes under the regulations of this Treaty according to Article 10, "volunteer aid societies, duly recognized and authorized by their respective Governments," such recognition and authority having been conferred upon the American National Red Cross in the Charter granted by Congress, January 5, 1905, Sec. 2, "The corporation hereby created is designated as the organization which is authorized to act in matters of relief under said Treaty," and, furthermore,

WHEREAS, In the Revised Treaty of Geneva, 1906, in Article 27, it is provided that "the signatory powers whose legislation should not now be adequate, engage to take or recommend to their legislatures such measures as may be necessary to prevent the use by private persons or by societies other than those upon which this Convention confers the right thereto of the emblem or name of the Red Cross or Geneva Cross,"

Be it Resolved, That the Executive Committee of the American National Red Cross requests that all hospitals, health departments, and like institutions kindly desist from the use of the Red Cross created for the special purpose mentioned above, and suggests that for it should be substituted some other insignia, such as a green St. Andrew's Cross on a white ground, to be named the "Hospital Cross," and used to designate all hospitals (save such as are under the Medical Departments of the Army and Navy and the authorized volunteer aid society of the Government), all health departments and like institutions, and, further,

Be it Resolved, That the Executive Committee of the American National Red Cross likewise requests that all individuals or business firms and corporations who employ the Geneva Red Cross for business purposes, kindly desist from such use, gradually withdrawing its employment and substituting some other distinguishing mark.

NATIONAL ASSOCIATION FOR THE STUDY AND PREVENTION OF TUBERCULOSIS. TRANSACTIONS OF THE THIRD ANNUAL MEETING, WASHINGTON, D. C., MAY, 1907.

The Transactions of The National Association for the Study and Prevention of Tuberculosis are a series of publications which should be familiar to all students of tuberculosis. To members of the Association they are distributed free, and to others sold from the executive office, 105 East 22d Street, New York. The volumes appear annually and embody the papers read at the yearly meeting of the Association. They reflect the progress of knowledge in practically all phases of the tuberculosis questions—many being purely scientific and adapted only to students of bacteriology or pathology, others to the clinician or the social worker, while still others are of such general character that they are interesting and instructive to lay readers.

The third volume of the series containing the proceedings of the meeting in Washington in May last has just appeared. It lacks none of the interest of the earlier numbers, is a most creditable production, and demonstrates what splendid work the Association is doing. It contains 366 pages, opening with the address of Dr. Biggs, the President; Dr. Flick reports upon the International Congress of Tuberculosis which is to be held in this country in 1908; Dr. Farrand reviews the Campaign against Tuberculosis in the United States; then follow papers on a wide range of topics with the discussions thereon. These are too numerous for mention in detail, but a few of the titles taken at random will indicate how wide a field is covered.

"Compulsory Notification and Registration of Tuberculosis," Hermann M. Biggs, New York.

"The Class Method of Treating Consumption in the Homes of the Poor," Joseph H. Pratt, Boston.

"A Working Program for a Small City," Oscar H. Rogers, Yonkers, N. Y.

"School and Tuberculosis," John H. Lowman, Cleveland.

"Reports of Committees on Clinical Nomenclature, on Medication, and on Mixed Infection."

"The Split Products of the Tubercle Bacilli and Their Effects upon Animals," Victor C. Vaughan and Sybil May Wheeler, Ann Arbor.

"Homologous Bacteria as a Vaccine in Tuberculosis," Albert H. Allen, Saranac Lake.

"The Living Pathology of Tuberculosis of the Bones in Early Life," Thomas M. Rotch and Arial W. George, Boston.

"The Treatment of Surgical Tuberculosis by Hyperemia (Bier)," Von Schmieden, Bonn, Germany.

THE MARY PUTNAM JACOBI FELLOWSHIP.

The Women's Medical Association of New York City desiring to pay a permanent tribute to Dr. Mary Putnam Jacobi invites the co-operation of all who desire to further the higher medical education of women of the United States in founding a fellowship to bear her name.

The Fellowship Fund to aid post-graduate women students in medicine must amount to at least $25,000, in order to provide an annual income of $1000. The sum of $8000 has already been contributed; Mrs. Russell Sage has given $1000, and other contributions have ranged from $500 to $2.

Dr. Mary Putnam Jacobi received her degree in medicine from the Women's Medical College of Pennsylvania, and later secured an international reputation as a woman physician. Largely through her efforts the École de Médecine in Paris was opened to women. She was the first woman admitted to the New York Academy of Medicine. Her hospital work and writings marked her as a woman of brilliant ability, and gave to her a rank in the medical profession at large which no other woman has as yet obtained, and a position of equality with the most prominent leaders in the science of medicine.

Among those interested in this memorial, whose names are on the list of honorary members of the committee are: Prof. Felix Adler, Mr. Jacob A. Riis, William Osler, M. D., Pres. Nicholas Murray Butler, Hon. Seth Low, Pres. Benjamin Ide Wheeler, Mrs. Henry Villard, Pres. M. Cary Thomas, Mr. Richard Watson Gilder, Dean Laura Drake Gill, Rev. Percy Stickney Grant, Pres. J. Y. Schurman, Miss Grace H. Dodge, Charles L. Dana, M. D., Howard A. Kelly, M. D., Mrs. Ellen H. Richards, Emily Blackwell, M. D., Francis P. Kinnicutt, M. D., Mrs. Frederick Nathan.

Contributions to the above-named fund will be gratefully received by Miss Eleanor Tomes, M. D., 136 East 30th Street, New York.

BOOKS RECEIVED.

The Prophylaxis and Treatment of Internal Diseases. By F. Forchheimer, M. D., 1906. 8vo. 652 pages. D. Appleton & Company, New York and London.

Clinical Diagnosis. A Text-Book of Clinical Microscopy and Clinical Chemistry for Medical Students, Laboratory Workers, and Practitioners of Medicine. By Charles Phillips Emerson, A. B., M. D. [1906.] 8vo. 641 pages. J. B. Lippincott Company, Philadelphia and London.

A Text-Book of Human Physiology. By Dr. Robert Tigerstedt. Translated from the third German edition and edited by John R. Murlin, A. M., Ph. D. With an introduction to the English edition by Professor Graham Lusk, Ph. D., F. R. S. (Edinb.). 1906. 8vo. 751 pages. D. Appleton & Company, New York and London.

A Non-Surgical Treatise on Diseases of the Prostate Gland and Adnexa. By George Whitfield Overall, A. B., M. D. 1906. 12mo. 228 pages. Rowe Publishing Company, Chicago.

Manual of Anatomy. Systematic and Practical. Including Embryology. By A. M. Buchanan, M. A., M. D., C. M., F. F. P. S. (Glas.) Vol. I. Osteology; Upper Limb; Lower Limb. With 268 illustrations, mostly original and in colors. 1906. 8vo. 596 pages. W. T. Keener & Co., Chicago.

United States, War Department, Surgeon-General's Office. Index-Catalogue of the Library. Authors and Subjects. Second series. Vol. XI. Mo—Nyström. 1906. 4to. 858 pages. Government Printing Office, Washington.

Medical and Surgical Report of the Presbyterian Hospital in the City of New York. Vol. VII. 1906. Edited by John S. Thacher, M. D., George Woolsey, M. D. 8vo. 235 pages. Trow Directory Printing and Bookbinding Company, New York.

Progressive Medicine. A Quarterly Digest of Advances, Discoveries, and Improvements in the Medical and Surgical Sciences. Edited by Hobart Amory Hare, M. D., assisted by H. R. M. Landis, M. D. Vol. III. September, 1906. 8vo. 298 pages. Lea Brothers & Co., Philadelphia and New York.

Chemistry: General, Medical, and Pharmaceutical, including the Chemistry of the U. S. Pharmacopœia. By John Attfield, F. R. S. Edited by Leonard Dobbin, Ph. D. (Würzburg), F. I. C., F. C. S. Nineteenth edition. 1906. 12mo. 756 pages. Lea Brothers & Co., Philadelphia and New York.

International Clinics. A Quarterly of Illustrated Clinical Lectures and Especially Prepared Original Articles. By Leading Members of the Medical Profession Throughout the World. Edited by A. O. J. Kelly, A. M., M. D. Vol. III. Sixteenth series, 1906. 8vo. 302 pages. J. B. Lippincott Company, Philadelphia and London.

A Text-Book of Genito-Urinary Diseases. Including Functional Sexual Disorders in Man. By Doctor Leopold Casper. Translated and edited with additions by Charles W. Bonney, B. L., M. D. With 213 illustrations and 23 full-page plates, of which 7 are in colors. 1906. 8vo. 618 pages. P. Blakiston's Son & Co., Philadelphia.

Prevalent Diseases of the Eye. A Reference Handbook Especially Adapted to the Needs of the General Practitioner and the Medical Student. By Samuel Theobald, M. D. With 219 illustrations and 10 colored plates. 1906. 8vo. 551 pages. W. B. Saunders Company, Philadelphia and London.

A Manual of Otology. By Gorham Bacon, A. B., M. D. With an Introductory Chapter by Clarence John Blake, M. D. Fourth edition, revised and enlarged. With 134 illustrations and 11 plates. 1906. 12mo. 485 pages. Lea Brothers & Co., New York and Philadelphia.

Operative Gynecology. By Howard A. Kelly, A. B., M. D., LL. D., F. R. C. S. (Hon. Edinb.). With 11 plates and 703 original illustrations, for the most part by Max Brödel Second edition, revised and enlarged. Two volumes. 1906. 8vo. D. Appleton & Company, New York and London.

An Introduction to Physiology. By William Townsend Porter, M. D. 1906. 12mo. 587 pages. J. B. Lippincott Company, Philadelphia and London.

Stöhr's Histology. Arranged upon an Embryological Basis by Dr. Frederic T. Lewis. From the twelfth German edition by Dr. Philipp Stöhr. Sixth American edition. With 450 illustrations. 1906. 8vo. P. Blakiston's Son & Company, Philadelphia.

A Treatise on Surgery. By George Ryerson Fowler, M. D. Containing 888 text illustrations and 4 colored plates, all original. Vol. II. 1906. 4to. 714 pages. W. B. Saunders Company, Philadelphia and London.

Modern Clinical Medicine. Diseases of the Digestive System. Edited by Frank Billings, M. D. An authorized translation from "Die Deutsche Klinik" under the general editorial supervision of Julius L. Salinger, M. D. 1906. 8vo. 824 pages. D. Appleton & Company, New York and London.

Elementary Manual of Regional Topographical Dermatology. By R. Sabouraud. English translation by C. F. Marshall. With 231 illustrations in the text. 1906. 8vo. 660 pages. Rebman Company, New York; Rebman Limited, London.

The Treatment of Syphilis. By Alfred Fournier. English translation of the second edition (revised and enlarged) by C. F. Marshall, M. D., F. R. C. S. 1906. 8vo. 219 pages. Rebman Limited, London; Rebman Company, New York.

The Diseases of Women. A Handbook for Students and Practitioners. By J. Bland-Sutton, F. R. C. S. (Eng.), and Arthur E. Giles, M. D., B. Sc. (Lond.), F. R. C. S. (Edin.). Fifth edition. With 129 illustrations. 1906. 12mo. 536 pages. Rebman Limited, London; Rebman Company, New York.

Conferences on the Moral Philosophy of Medicine. Prepared by An American Physician. [1906.] 12mo. 368 pages. Rebman Company, New York; Rebman Limited, London.

Atlas of Cutaneous Morbid Histology. Consisting of 53 colored figures on 24 plates and text. By Dr. Max Joseph and J. B. Van Deventer. 1906. 4to. 48 pages. W. T. Keener & Company, Chicago.

Text-Book of Comparative General Pathology. For Practitioners and Students of Veterinary Medicine. By Professor Dr. Th. Kitt. Authorized translation by Dr. William W. Cadbury. Edited with notes and additional illustrations by Dr. Allen J. Smith. Illustrated with 4 colored plates and 131 text illustrations. 1906. 8vo. 471 pages. W. T. Keener & Company, Chicago.

Practical Text-Book of Midwifery for Nurses. By Robert Jardine. With 49 illustrations. Third edition. 1906. 12mo. 276 pages. Henry Kimpton, London; W. T. Keener & Company, Chicago.

Mercer's Company Lectures on Recent Advances in the Physiology of Digestion. Delivered in the Michaelmas Term, 1905, in the Physiological Department of University College, London. By Ernest H. Starling, M. D., F. R. S. With 12 illustrations. 1906. 8vo. 156 pages. W. T. Keener & Company, Chicago.

Kimpton's Essential Series. Essentials of Medical Electricity. By Edward Reginald Morton. With 11 plates and 70 illustrations. 1905. 12mo. 192 pages. Henry Kimpton, London; W. T. Keener & Company, Chicago.

Essentials of Human Physiology. By D. Noël Paton, M. D., B. Sc., F. R. C. P. (Ed.) Second edition, revised and enlarged. 1905. 8vo. 444 pages. W. T. Keener & Company, Chicago; William Green & Sons, Edinburgh and London.

A Treatise on the Motor Apparatus of the Eyes. Embracing an Exposition of the Anomalies of the Ocular Adjustments and their Treatment, with the Anatomy and Physiology of the Muscles and their Accessories. By George T. Stevens, M. D., Ph. D. Illustrated with 184 engravings, some in colors. 1906. 8vo. 496 pages. F. A. Davis Company, Philadelphia.

The Ear and its Diseases. By Seth Scott Bishops, B. S., M. D., LL. D. Illustrated with 27 colored lithographs and 200 additional illustrations. 1906. 8vo. 439 pages. F. A. Davis Company, Philadelphia.

Outlines of Human Embryology. A Medical Student's Handbook of Embryology. By George Reese Satterlee, M. A., M. D. First edition. 1906. 12mo. 173 pages. John Wiley & Sons, New York; Chapman & Hall, London.

Genito-Urinary Diseases and Syphilis. By Henry H. Morton, M. D. Second edition, revised and enlarged. Illustrated with 158 half-tones and photo-engravings, and 7 full-page color-plates. 1906. 8vo. 500 pages. F. A. Davis Company, Philadelphia.

American Practice of Surgery. A Complete System of the Science and Art of Surgery. By Representative Surgeons of the United States. Editors: Joseph D. Bryant, M. D.; Albert H. Buck, M. D. Vol. I. Profusely illustrated. 1906. 4to. 818 pages. Willam Wood & Company, New York.

The Diseases of the Nose, Throat, and Ear. By Charles Prevost Grayson, A.M., M. D. Second edition, revised and enlarged. 1906. 8vo. 532 pages. Illustrated with 152 engravings and 15 plates in colors and monochrome. Lea Brothers & Co., Philadelphia and New York.

A Text-Book on the Practice of Gynecology. By William Easterly Ashton, M. D., LL. D. With 1057 new line drawings illustrating the text. By John V. Alteneder. Third edition, revised and enlarged. 1906. 8vo. 1097 pages. W. B. Saunders Company, Philadelphia and London.

A Treatise on Surgery. By George Ryerson Fowler, M. D. Containing 888 text-illustrations and 4 colored plates, all original. Vol. I. 1906. 4to. 722 pages. W. B. Saunders Company, Philadelphia and London.

Abdominal Surgery. By B. G. A. Moynihan, M. S. (London), F. R. C. S. (Leeds). Second edition, thoroughly revised. 1906. 8vo. 815 pages. W. B. Saunders Company, Philadelphia and London.

A Manual of the Diseases of Infants and Children. By John Ruhräh, M. D. Illustrated. W. B. Saunders Company, Philadelphia and London.

Manual of Clinical Chemistry. By B. A. E. Austin, A. B., M. D. 1907. 12mo. 278 pages. D. C. Heath & Co., Boston.

International Clinics. A Quarterly of Illustrated Clinical Lectures and Especially Prepared Original Articles. By Leading Members of the Medical Profession Throughout the World. Edited by A. O. J. Kelly, A. M., M. D. Vol. IV. Sixteenth series. 1906. 8vo. 322 pages. J. B. Lippincott Company, Philadelphia and London

Atlas and Text-Book of Human Anatomy. By Johannes Sobotta. Edited with additions by J. Playfair McMurrich. Vol. I. Bones, Ligaments, Joints, and Muscles. Vol. II. The Viscera, Including the Heart. 1906. 8vo. W. B. Saunders Company, Philadelphia and London.

Surgery: Its Principles and Practice. By Various Authors. Edited by William Williams Keen, M. D., LL. D. Vol. I. With 261 text-illustrations and 17 colored plates. 1906. 8vo. 983 pages. W. B. Saunders Company, Philadelphia and London.

Beiträge zur Syphilis-Forschung. Von Dr. Max von Niessen, Wiesbaden. IX. 1906. 4to. Selbstverlag.

Tumors. Innocent and Malignant. Their Clinical Characters and Appropriate Treatment. By J. Bland-Sutton, F. R. C. S. Fourth edition. With 355 engravings. 1907. 8vo. 675 pages. W. T. Keener & Company, Chicago.

Pulmonary Tuberculosis. Its Modern and Specialized Treatment. By Albert Philip Francine. Illustrated. [1906.] 8vo. 247 pages. J. B. Lippincott Company, Philadelphia and London.

Progressive Medicine. A Quarterly Digest of Advances, Discoveries, and Improvements in the Medical and Surgical Sciences. Edited by Hobart Amory Hare, M. D.; assisted by H. R. M. Landis, M. D. Vol. IV. December, 1906. 8vo. 349 pages. Lea Brothers & Co., Philadelphia and New York.

Studies in Gynecology. Presented in the Form of Illustrated Problems for Classroom Work. By John A. Sampson, A. B., M. D. 1907. 4to. 442 pages. Fort Orange Press, Albany, N. Y.

Scientific Memoirs. (New Series) No. 26. Leucocytozoon Canis. By Captain S. R. Christophers, M. B., I. M. S. 1906. 4to. 16 pages. Office of the Superintendent of Government Printing, Calcutta, India.

Cook County Hospital Reports, 1906. Compiled and edited under the direction of the Publication Committee of the Cook County Hospital Attending Staff. Dr. W. L. Baum, Dr. C. L. Mix, Dr. C. E. Kahlke, Dr. E. R. Le Count, Dr. W. A. Evans. 1906. 8vo. 304 pages. Henry O. Shepard Company, Chicago.

Tumors of the Cerebrum. Their Focal Diagnosis and Surgical Treatment. By Charles K. Mills, M. D.; Charles H. Frazin, M. D.; Wm. G. Spiller, M. D.; G. E. De Schweinitz, M. D.; Theodore H. Weisenburg, M. D. 1906. 8vo. Philadelphia.

Transactions of the American Ophthalmological Society. Forty-second Annual Meeting. New York City, 1906. Vol. XI. Part 1. Published by the Society, Hartford.

Text-Book of Psychiatry. A Psychological Study of Insanity. By Dr. E. Mendel. Authorized translation edited and enlarged by William C. Krauss, M. D. 1907. 8vo. 311 pages. F. A. Davis Company, Philadelphia.

A Treatise on Orthopedic Surgery. By Royal Whitman, M. D. Third edition, revised and enlarged. Illustrated with 554 engravings. 1907. 8vo. 871 pages. Lea Brothers & Co., Philadelphia and New York.

The Harvey Lectures. Delivered under the Auspices of The Harvey Society of New York, 1905-06. By Prof. Hans Meyer, Prof. Carl von Noorden, Prof. Frederick G. Novy, Dr. P. A. Levene, Prof. W. H. Park, Prof. Lewellys F. Barker, Prof. Frederick S. Lee, Prof. Lafayette B. Mendel, Prof. T. H. Morgan, Prof. Charles S. Minot, Prof. J. Clarence Webster, Prof. Theobald Smith, Prof. W. H. Howell. 1906. 8vo. 337 pages. J. B. Lippincott Company, Philadelphia and London.

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CONTENTS.

PAGE

Some of the Conditions Which Have Influenced the Development of American Medicine, Especially during the Last Century.
By William H. Welch, M. D. 33

Diagnosis and Treatment of Neurasthenia.
By John K. Mitchell, M. D. 41

Abscess of Bone Caused by an "Intermediate" Bacillus (B) Allied to B. Paratyphosus.
By F. G. Bushnell, M. D., D. P. H. 44

Sudden Death in Pleurisy with Effusion Due to a Change of Position. (Illustrated.)
By W. J. Calvert, M. D. 44

Proceedings of Societies:
The Johns Hopkins Medical Society. 47
Exhibition of Cases [Dr. Emerson];—Anuria and Nephrostomy by the Ureter [Dr. Kelly];—Eclampsia without Convulsions [Dr. Slemons];—Presentation of Cases [Dr. Cushing];—The Effect of Pressure on the Stethoscope on the Intrathoracic Sounds [Dr. Chas. P. Emerson];—A Lantern Slide Demonstration of the Hystopathology of Experimental Urticaria Factitia [Dr. Gilchrist];—Exhibition of Cases [Dr. Thayer];—Exhibition of Pathological Cases [Dr. MacCallum];—A Theory of Vagus Inhibition [Dr. Howell and Mr. Duke].

Notes on New Books. 51

Summaries or Titles of Papers by Members of the Hospital or Medical School Staff Appearing Elsewhere than in the Bulletin. 56

Books Received. 62

SOME OF THE CONDITIONS WHICH HAVE INFLUENCED THE DEVELOPMENT OF AMERICAN MEDICINE, ESPECIALLY DURING THE LAST CENTURY.[1]

By William H. Welch, M. D.,

Professor of Pathology, Johns Hopkins University.

I esteem it a privilege and honor upon this auspicious occasion, in behalf of my fellow alumni, to bring our affectionate greetings and hearty felicitations to our *alma mater* in medicine upon the completion of a century of unbroken, vigorous life and of memorable service in medical education. As I read our history we could, with propriety, commemorate a much longer existence by virtue of the union with Columbia University and as the direct descendants of the medical school of Kings College, founded in 1767, but we need to unravel no tangled skeins of history—how tangled we have just heard from Dr. Curtis—in celebrating the centennial anniversary of the institution which most of the graduates know best under the name of the College of Physicians and Surgeons of New York.

[1] An address delivered at the Centennial Celebration of the College of Physicians and Surgeons, Columbia University, New York, June 11, 1907.

The thoughts which this anniversary brings first to the mind of each of us who are graduates of this college doubtless relate to his own personal experiences when a student within its walls. The reminiscences of very few go back to the Crosby Street days, of many to the Twenty-third Street school, and of still more to the college in its present location. To me, and to many others, of the days of the seventies, come back in vivid memory the old Twenty-third Street building, even then outgrown, and our teachers, Parker, Clark, Dalton, Detmold, Markoe, St. John, Thomas, Sands, Sabine, Draper, Agnew, Seguin, Otis, among those who are gone, and of those fortunately with us, Jacobi, Edward Curtis, McLane, Chandler, Delafield, John Curtis, McBurney, Weir, and Lefferts, all of whom we hold in grateful remembrance. Among these are names of many illustrious in the history of the college and of American medicine—Willard Parker, for over forty years a notable figure in the college and the city; Alonzo Clark, the year of whose birth is also that of the college, the leading con-

sultant of the city, a charming, polished, and withal forceful lecturer; John Dalton, the first of American physiologists, the embodiment of scientific spirit and method, a direct, clear and most attractive teacher; Gaillard Thomas, gifted as man and teacher, widely influential as an author and practitioner, and honored in our profession; Henry B. Sands, full of enthusiasm and energy, a distinguished operator and contributor to surgery; Cornelius R. Agnew, the accomplished ophthalmologist and leader in works of public benevolence, and others whose names might, with equal propriety, be singled out from this roll of honor, but they are all familiar to you.

Fortunate circumstances brought me then, and later, especially under the personal influence of Jacobi, Thomas, Seguin, Sabine, and Delafield, from whom I received an abiding stimulus and inspiration. The college work which profited me most and which I recall with the greatest satisfaction was that of prosector to the chair of anatomy, which brought me into close association with Sabine and the demonstrators of anatomy, John Curtis and McBurney, and which afforded excellent practical training. Francis Delafield and Edward Janeway, a distinguished alumnus of this college, awakened at this time my interest in pathological anatomy. The preparation of my graduating thesis, under the advice of Sabine, was a valuable educational task, which familiarized me with medical bibliography.

One can decry the system of those days—the inadequate preliminary requirements, the short courses, the faulty arrangement of the curriculum, the dominance of the didactic lecture, the meager appliances for demonstrative and practical instruction—but the results were better than the system. The College of Physicians and Surgeons stood then, as it has always stood, in the front rank of American medical schools. Our teachers were men of fine character, devoted to the duties of their chairs, they inspired us with enthusiasm, interest in our studies and hard work, and they imparted to us sound traditions of our profession; nor did they send us forth so utterly ignorant and unfitted for professional work as those born of the present, greatly improved methods of training and opportunities for practical study are sometimes wont to suppose. Clinical and demonstrative teaching for undergraduates already existed and was rapidly expanding in those days, but the experience of a hospital interneship was then, as it still is, almost a necessity to complete the education of a physician before beginning practice. Of laboratory training there was none.

We all rejoice in the splendid, material advancement of the college in the last two decades, in the integral union with Columbia University, in the generous gifts of benefactors, in this fine home, in the excellent laboratories, in the Sloane Maternity Hospital, in the Vanderbilt Clinic, and in the work of teachers and of taught under these improved conditions and enlarged resources, but many of us cherish fond memories of simpler days, of teachers as able and devoted as their worthy successors, and of fellow students as zealous as those of the present day.

While I could not refrain from recalling these student days and paying grateful homage to our teachers, I realize that this occasion calls for a broader outlook than merely personal reminiscences and that matters pertaining to the history of the college belong to the theme of Dr. Curtis's address. I trust that I shall not encroach upon his territory in asking your attention to a consideration, necessarily brief and inadequate, of some of the conditions of American medicine at the time of the foundation of this college and shortly preceding it, and of some of the developments since that period.

The century of life of this college comprises in time more than one-third of the medical history of this country and in amount of progress far more than this fraction. The conditions which influenced the development of American medicine before the nineteenth century were mainly such as were determined by the material, political and social circumstances of the country.

The small beginnings of our medical annals belong to that splendid century which saw the birth of experimental science, the century of Shakespeare, Milton, and Molière in literature, of Bacon, Descartes and Locke in philosophy, of Kepler, Galileo and Newton in physical science, and of Harvey, Malpighi and Sydenham in medicine. What could seem more remote, more untouched by these brilliant achievements than the Thomas Wottons and Samuel Fullers and the little band of their successors who ministered in their feeble way to the bodily ills of the settlers scattered sparsely along the Atlantic coast! Yet we do well to cherish the memories of our medical pioneers, negligible though they be in the world's history of medicine, for their story has the interest which attaches to the origin of things which have become important.

It is pleasing to find that the leading cultivators of the natural history of the new world during the colonial period were physicians and that such men as Clayton, Mitchill, Colden, Garden, Kuhn, and of a somewhat later period Hosack, Barton, Wistar, Bigelow, and Torrey have been commemorated by genera of plants named after them. From this interest came a number of contributions to the vegetable materia medica. Here it may be recalled that in its early days there were connected as teachers with the College of Physicians and Surgeons, Samuel Latham Mitchill, David Hosack, and John Torrey, with whom was associated as pupil and collaborator, Asa Gray, all names of importance in the botanical history of this country. The story of Hosack's Elgin Botanic Garden is a familiar one to the members of Columbia University.

In illustration of the influence which the study of prevailing epidemic diseases has always exerted upon the development of medicine, it is interesting to note that the only substantial, permanent contributions to medical knowledge, made by American physicians before the end of the eighteenth century, pertained to the three great epidemic diseases which in succession sorely afflicted the colonies, namely: smallpox, by Zabdiel Boylston; diphtheria, by Peter Middleton, Richard Bayley and, above all, Samuel Bard; and yellow fever, by Lining, Matthew Carey, Currie, Rush, and others. William Currie's

"Historical account of the climates and diseases of the United States" and Noah Webster's "Brief history of epidemic and pestilential diseases" are of permanent value and were both published in this country before the end of the eighteenth century.

While the first American medical classic is John Morgan's "Discourse on the institution of medical schools in America," delivered in 1765, there appeared only six years later the second one—Samuel Bard's "Enquiry into the nature, cause, and cure of *angina suffocativa* or sore throat distemper, as it is commonly called by the inhabitants of this city and colony"—deserving a place beside Elisha North's treatise on spotted fever (1811), and Nathan Smith's essay on typhous fever (1824).

Samuel Bard, the leader in the foundation of the medical school of Kings College, its first professor of the theory and practice of physic, later its dean and the second president of the College of Physicians and Surgeons, second only to Rush in distinction among American physicians of his day, stands in the same paternal relation to the establishment of the first medical school in New York that Morgan and Shippen hold to that founded two years earlier in Philadelphia, and John Warren to the Harvard medical school started in 1783. Bard's address at Kings College commencement, in 1768, in which he forcibly advocated the establishment of a hospital, seems to have been hardly less notable and effective than the introductory discourse of his friend and fellow student in Edinburgh, John Morgan. Dr. Walter James has recently published in the *Columbia University Quarterly* (March, 1907) an interesting account of the life and services of his eminent predeeessor of one hundred and forty years ago in the chair of medicine.

Although during the quarter of a century preceding the Revolution, American medicine had received the seeds of a fresher life planted by such men as Bond, Shippen, Morgan, Bard, Jones, and the remarkable group of physicians in Charleston (Chalmers, Bull, Moultrie, Lining and Garden), the great stimulus to further development came from the increased medical and surgical experience gained during the War of Independence, the contact with better trained and more skilful foreign surgeons and the higher degree of self-reliance engendered by the new political conditions. Evidence of the growing independence of the new generation was the establishment, in 1797, by the scholarly Elihu Hubbard Smith, in conjunction with Samuel Latham Mitchill and Edward Miller—the two latter important members of the first faculty of this college—of the first American medical periodical—*The New York Medical Repository,* which served for many years as the chief medium of publication of medical papers in this country and survived until four years after the foundation in 1820 of the *Philadelphia Journal of the Medical and Physical Sciences,* which, in 1827 became the still vigorous *American Journal of the Medical Sciences.* Through these three journals can be traced the records of the greater part of America's valuable contributions to medicine.

When the curtain lifted upon the opening of the College of Physicians and Surgeons, in 1807, many already famous, or destined to honor in the annals of American medicine, were upon the stage. Benjamin Rush, taken all in all the greatest figure in American medicine and the sole American representative of the eighteenth-century type of medical philosopher and systematist, died in harness six years later. The colleagues of Rush in the medical faculty of the University of Pennsylvania at this time form a group of unusual distinction—William Shippen, one of the founders of the school and the Nestor of the faculty; Caspar Wistar, the pioneer of the systematic study of anatomy in America, beloved and of enduring fame; Benjamin Smith Barton, eminent as teacher and cultivator of natural science; Philip Syng Physick, a favorite pupil of John Hunter, the best trained and most influential American surgeon of his generation, and his nephew and adjunct professor, John Syng Dorsey, whose promising career was not cut short without a record of brilliant achievement. John Redmond Coxe, William P. Dewees, Nathaniel Chapman, and Joseph Parrish, soon to be connected with the university, were already active in the profession; John Redmond, the most prominent physician of Philadelphia in his day, the preceptor of Morgan, Rush, Wistar, and many others, was still living in his eighty-fifth year when the College of Physicians and Surgeons was founded.

Nathan Smith, more modern in spirit than Rush and more beneficial in his influence upon medicine to whom the lancet was not Rush's *magnum donum Dei,* had founded the Dartmouth medical school, in 1798, and later was to become the founder of the medical schools of Yale and of Bowdoin. The versatile and accomplished William Gibson, of delightful memory, was about this time a favorite pupil of Charles Bell and Astley Cooper in London. John Warren of revolutionary fame was at the height of his influence and his greater son, John Collins Warren, and James Jackson had begun their professional careers in Boston. Jacob Bigelow, the most original medical thinker whom this country has produced, had graduated from Harvard college.

The most picturesque and typically American group of physicians and surgeons at the time of the foundation of our college, and for some time later, was that of the frontier near the banks of the Ohio, the representatives in our profession of the indomitable courage, resourcefulness and native vigor of mind and body of the pioneers who blazed the path for civilization across the continent. The best of these men were, withal, abreast in knowledge, training, and skill with their contemporaries of the Atlantic coast; they were men of striking originality, substantial contributors to the sum of medical knowledge and art, powerful influences in the material, as well as the medical development of what was then the far west. Ephraim McDowell had been in practice in Kentucky for fourteen years when he performed the first ovariotomy, two years after the opening of this college. His younger and in his day even more influential contemporary, Benjamin W. Dudley, had already entered upon practice, which he was soon to interrupt, in order to secure the advan-

tages of medical study in Europe, in this following McDowell's excellent example. In the year this college was opened there began practice in Cincinnati Daniel Drake, the physician most typical of peculiarly American conditions, a genuine product of the soil, unlike McDowell and Dudley not trained in foreign schools, a real builder and great citizen, who spent forty years in accumulating the material for his monumental work on the "Diseases of the interior valley of North America."

The membership of the first and immediately succeeding faculties of the College of Physicians and Surgeons affords abundant evidence that New York had its full share of able physicians and surgeons, distinguished in their day and deserving our grateful remembrance. These were Nicholas Romayne, the first president and the one most active in the establishment of the college, an energetic, ambitious and powerful personality; Samuel Latham Mitchill, the most celebrated member of the faculty, the scientific oracle of the day, credited with universal learning, Senator of the United States, an active supporter of Robert Fulton, in whose first steamboat, the Clermont, he was a passenger on its first journey up the Hudson, the centennial anniversary of which coincides with that of this college; Samuel Bard, the second president of the college, now engaged in raising sheep and studying their diseases, who had for several years retired from practice, and has already been mentioned; his pupil, friend, partner, and successor, David Hosack, who became the dominant spirit in the college, already the leading physician of the city, and, like his pupil, John W. Francis, who was a member of the first graduating class and soon afterward of the faculty, combining social, literary, and scientific interests with those of his profession; Wright Post, who continued worthily the line of important New York surgeons begun by John Jones and soon to be adorned by the name of his greater colleague, Valentine Mott, the most celebrated operator of his day in this country, who became a member of the faculty in 1813, as did Post, when the medical faculty of Columbia College was absorbed by the College of Physicians and Surgeons; Edward Miller, sharing with Smith and Mitchill the fatherhood of medical journalism in this country, the first clinical teacher connected with the college, the scholarly author of medical papers of permanent value; William James Macneven, a leader with Emmet of the United Irishmen, the first of our medical refugees for political cause, a man of rare accomplishments, distinguished in his profession, establishing in this college in 1811 the first chemical laboratory in New York; John Augustine Smith, a Virginian, member of the first faculty, later president of William and Mary College, again professor and for twelve years president of the College of Physicians and Surgeons; James S. Stringham, an efficient early promoter of science in the United States, a pioneer teacher of medical jurisprudence in this country, a subject cultivated with distinguished success by Theodore Romeyn Beck, a member of the first graduating class, assisted by his younger brother, the learned John B. Beck, also a graduate, and for many years professor of materia medica and medical jurisprudence in the college; Archibald Bruce, a name familiar to mineralogists, giving to the College of Physicians and Surgeons the singular distinction of establishing the first chair of mineralogy in this country. There was also established in 1814, a professorship of natural philosophy held by Benjamin DeWitt, who had been a member of the faculty from the beginning. It is somewhat interesting to note the varied nationalities represented in the immediate or near ancestry of these members of the first faculties, *viz.:* English, Scotch, Irish, Dutch, French Huguenot, German, and Swiss.

A characteristic feature of American medicine in the period which we are now considering is the position of extraordinary preeminence occupied by the leaders during their day and generation. We cannot read today without a smile, in the biographical dictionaries of Thacher, Williams, and Gross, the glowing eulogies of the resplendent virtues and immortal fame of men whose names are overlooked in the histories of universal medicine or receive perhaps a line or two. The height to which these men attained is to be measured by the generally low level of attainment of their professional brethren rather than by their own actual contributions. Our national medical heroes of this period played upon a small stage a part which then seemed large. A few, chiefly surgeons, as McDowell, Nathan Smith, Warren, and Mott, contributed not a little to improvement of the art and many were well educated men of force and ability who did much to elevate professional standards in America. There will never exist again, in this country, so great a disparity of attainment in the members of our profession, and the few can never rise again so high above the general level of their colleagues.

Biographical sketches and the many addresses of Hosack and of Francis afford us abundant material for learning what manner of men were the early occupants of the professional chairs in this college and what social and professional conditions surrounded them. Especially rich in information of this character is Dr. Francis's delightful book "Old New York."

Bard, Hosack, and Francis, each the foremost physician of his day in this city, belong to the medical lineage of John Radcliffe and Richard Mead and had the gold-headed cane crossed the Atlantic, it would have descended in succession to them. Francis was the last representative in this city of this type of physician—inheritors and conservators of old traditions, representatives of the best practice of the times, whose large success and dominant influence rest upon good sense and strongly marked personal characteristics rather than great learning, remembered long by anecdote and tradition, prominent figures not in professional circles alone, but also in the public, the social and the literary life of the city, dispensers of a generous hospitality in homes frequented by the wits and notables of the day.

Bard, Hosack, and Francis, while under the influence of the prevailing medical theories of Boerhaave, Van Swieten, Cullen, Brown, and Rush, were each imbued with a saving measure of the inductive method. Hosack advocated vigorously the establishment of municipal hospitals for contagious diseases, national quarantine regulations, and a proper system of city drainage. His "Observations on febrile contagion and on the

means of improving the medical police of the city of New York" should perpetuate his memory in this city. Although the author of "A system of practical nosology," as dreary as similar works, he said that the principles of medical practice must be gained through "accurate observation, judicious experiment, and cautious induction from the facts which they present," and we can say nothing more and nothing better today. In a like spirit Francis says: "It may be written as an axiom, you might as well create a practical navigator by residence in a sylvan retreat, as furnish a physician without hospital experience."

The character of the early medical schools of this country was determined largely by the influences and traditions of the school at Edinburgh, where the founders and first teachers of our schools received the most valuable part of their professional training under such teachers as Cullen, the Munros, Whytt, Black, Hope, the Gregorys, and the Hamiltons. When the College of Physicians and Surgeons was founded, medical teaching was still much better organized and conducted in Edinburgh than in London, but the immediate successors of Cullen, the second Munro and Black, were less important and able teachers than their predecessors, and American students of medicine at this period in Great Britain received the greatest stimulus from the extramural teaching of John Bell and John Barclay in Edinburgh and from study under Abernethy, Astley Cooper and others in London.

It was especially during the first two decades of the nineteenth century that the influences of English, as distinguished from Scottish, medicine were brought to this country, although these influences were not lacking at an earlier period, especially upon surgery. Thus Thomas Cadwallader of Philadelphia had been a pupil of Cheselden, John Jones of Percival Pott, and the American pupils of the Hunters were fairly numerous, including among others Jones, Morgan, Shippen, Bard, Bayley, and Physick. Although not a teacher, there was no British physician who took so active and friendly an interest in medical conditions in this country and in American students visiting Great Britain in the latter half of the eighteenth century as did the great London physician, John Fothergill. He had many correspondents in America, was the adviser of Morgan and of Bard in planning the first medical schools in Philadelphia and in New York, was a generous benefactor of the Pennsylvania Hospital, was one of the incorporators of the New York Hospital, the charter of which was granted in 1771, and he assisted in raising money for it. His name we should hold in grateful remembrance, as well as that of his friend and successor, another quaker physician of London, John C. Lettsom, who continued after Fothergill's death to manifest a similar interest.

Of the many teachers of medicine in London in the early part of the nineteenth century the two who stand out most conspicuously above their contemporaries as an attraction to students and exerting a far reaching influence are John Abernethy and Astley Cooper, both pupils of John Hunter, Abernethy being the especial custodian of Hunter's physiological views, a vigorous and admirable teacher with remarkable powers of exposition, and Cooper, an interesting practical lecturer, meddling little with theories, and occupying a position before the public such as probably no surgeon before or since has held. These great teachers inspired, as few have done, their pupils with enthusiasm and when we recall that among their American pupils were such men as David Hosack, James Jackson, John Collins Warren, Nathaniel Chapman, John Syng Dorsey, Valentine Mott, William Gibson, Benjamin W. Dudley, John W. Francis, Alexander H. Stevens, Edward Delafield, John Wagner, John Kearny Rodgers, we can realize the great influence which they must have exerted upon the generation of American physicians and surgeons of the first quarter of the last century, an influence which has hitherto hardly received the attention from medical historians which it merits and which was comparable, although quite different in kind, to that brought to this country at a later date by the pupils of Louis.

In general the conditions of medical teaching in London at this period were far from satisfactory. There were no completely and properly organized medical schools. There were many private medical schools of which the best continued to be the Great Windmill Street School, founded by William Hunter, where William Hewson, Matthew Baillie, and William Cruikshank had taught the latter part of the eighteenth century, and where in the first and second decades of the succeeding century the leading teachers were James Wilson, Benjamin Brodie, Charles Bell, and John Shaw. The independent schools of John Sheldon and of Andrew Marshall in the latter part of the eighteenth century had also been much frequented by American students, and at a later period we hear of many other private schools, as the Webb Street School, Aldersgate Street School, Little Dean Street School, Carpue's, Brookes's, Haighton's, Hooper's, Taunton's, Dermott's, and others. It was not uncommon for a physician or a group of physicians to advertise in the newspapers courses of lectures, and in some instances the purpose seems to have been mainly the advertisement rather than the expectation of securing students.

Lectures to students were given at several of the hospitals, the best at the United Borough Hospitals (St. Thomas's and Guy's) by Cooper, the Clines and Babington; at St. Bartholomew's by Abernethy and his demonstrator William Lawrence, James Earle, the son-in-law of Percival Pott and at this time the leading surgeon to the hospital, and Richard Powell; at St. George's by Sir Everard Home and his demonstrator and assistant Benjamin Brodie, and George Pearson, a very successful and popular teacher of medicine and chemistry; at the London Hospital, by Sir William Blizard and John Cooke; at Westminster Hospital by Sir Anthony Carlisle, and at Middlesex Hospital by Charles Bell, already engaged in those investigations of the nervous system which have immortalized his name. Matthew Baillie was the leader of the medical profession in London at this period and his influence was strongly felt, although he had ceased teaching before the century opened. Notwithstanding their able teachers it was not until the fourth decade of the nineteenth century that the hospital medical schools gained the ascendancy over the private schools,

some of which continued to exist until long after the middle of the century.

The subjects most thoroughly cultivated and taught in London were anatomy, surgery, and midwifery, and it is upon these subjects more than upon internal medicine that the impress of English influences has been most strongly marked in this country. The teaching of anatomy and surgery was usually combined. The list of important teachers, beginning in the first quarter of the eighteenth century with Cheselden and John Douglas, is a long one and includes Samuel Sharp, Edward Nourse, Percivall Pott, William and John Hunter, Henry Cline, Sir William Blizard, Sir James Earle, John Abernethy, Sir Everard Home, Sir Astley Cooper, Sir Anthony Carlisle, and Sir Charles Bell, and of a generation beginning their activity in the first and second decades of the nineteenth century Sir Benjamin Brodie, Sir William Lawrence, Benjamin Travers, and Joseph Henry Green. More especially known as teachers of anatomy in London from the middle of the eighteenth century on were William Hewson, John Sheldon, Andrew Marshall, William Cruikshank, Matthew Baillie, James Wilson, Joshua Brookes, and Joseph Carpue. The important names as teachers of midwifery beginning with James Douglas early in the eighteenth century were William Hunter, William Smellie, Thomas Denman, William Osborne, John and Sir Charles Clarke, Samuel Merriman, and Robert Gooch. The Dublin school of midwifery founded by Sir Fielding Ould and John Fleury soon after the middle of the eighteenth century reached a high point of efficiency and prosperity under Joseph Clark at the period which we are considering.

George Fordyce and William Saunders, both Scotsmen and pupils of Cullen, had introduced in London in the latter part of the eighteenth century the Cullenian doctrines and system of teaching medicine. The great reform in clinical teaching initiated by Graves and Stokes in Dublin and by Richard Bright, Thomas Addison, Peter Mere Latham, and Archibald Billing in London in the third decade of the nineteenth century came at a time when the influence of French medicine began to be more strongly felt in this country, and it is more especially to the latter that the corresponding improvement in America is to be attributed.

In two special directions there were excellent opportunities for training in London at this period, namely in cutaneous diseases under Robert Willan and Thomas Bateman, and in ophthalmology and otology under John Cunningham Saunders, who was active in founding the institution now known as Moorfields Ophthalmic Hospital, and at a little later period under Travers, Lawrence, and Guthrie. In the second decade of the nineteenth century Edward Delafield, for many years president of this college, returned after studying in London and with J. Kearny Rodgers established in 1820 the New York Eye and Ear Infirmary, with which he was connected for fifty years, and introduced there and in the college the teaching of ophthalmology.

This period of English medicine, to which we must attribute an especial influence upon medicine in this country, was by no means sterile, although overshadowed by the more brilliant contemporaneous school in Paris. The English surgeons were at least the equals of their French contemporaries. The influence of Percival Pott and of John Hunter upon their pupils and successors was profound and most stimulating. Matthew Baillie had created an interest in morbid anatomy which led to many valuable contributions and prepared the way for Bright, Addison, and Hodgkins. The admirable and distinctive type of English physician which had been represented by such men as Sydenham, Huxham, Fothergill, and Heberden was perpetuated by Baillie, Baker, Pitcairn, Saunders, Latham, Powell, and others. Charles Bell was laying the foundations of neurophysiology. There was great interest in physiological experimentation and in experimental science in general. The great natural philosophers Thomas Young and Wollaston were actively identified with the medical profession and the genius of Sir Humphrey Davy had been fostered under medical surroundings. American students in London at this time often speak with enthusiasm of the lectures of Davy at the Royal Institution founded by their countryman, Count Rumford. The study of the natural sciences, particularly of botany and of chemistry, was very generally combined with that of medicine, and many of our American students of medicine returned well grounded in these sciences as they then existed and continued to cultivate them. Reference has already been made to the position which these sciences occupied in the curriculum of our medical schools, which were at this period their chief home in this country.

While it is evident that we can attribute much that is valuable to the influence of English upon American medicine at the period when the College of Physicians and Surgeons was founded, familiarity with the system of medical teaching then prevalent in London did not exert an influence upon the development of medical education in this country so fortunate as that derived from Leyden and from Edinburgh had done upon our first medical schools. The idea of establishing private medical schools divorced from any connection with a college of liberal arts or a university and free from any responsible control was transplanted to this country from London and was developed to an extreme which became peculiarly American. The London schools never dreamed of conferring the doctor's degree or of granting the license to practice. They encountered opposition even in having their courses recognized by the examining and licensing bodies, and their defects were largely compensated by the practical training secured by the apprenticeship system and by hospital pupillage and dressership.

Undoubtedly special conditions pertaining to the rapid pioneer development of the country contributed to the establishment in the second and later decades of the last century of the many private medical schools which brought our system of medical education to such a low standard of efficiency and introduced evils from which we are not yet wholly free. An interesting and distinctively American type of physician sprang from these peculiar conditions, namely the peripatetic professor who, travelling from school to school, often acquired

great fame as a lecturer. Out of a long list John Delamater (1787-1867) may be selected as probably unsurpassed as a college lecturer of this type. He lectured at Pittsfield, Fairfield, Willoughby, Geneva, Cleveland, Bowdoin, and Dartmouth, and left manuscript notes of over seventy different courses on almost every branch of medicine.

At the time of the organization of the College of Physicians and Surgeons the great awakening which marked the dawn of a new era was already under way in France, but the new movement was slow in spreading and it was not until the fourth decade of the last century that it reached America, where it proved as fructifying a power for good as it had been elsewhere. The movement ultimately led to the establishment of the science of medicine upon a broad, biological basis. It was ushered in toward the close of the eighteenth century by Lavoisier's discovery of the true nature of respiration and of the sources of animal heat. The chief instruments of advancement in the beginning were general and pathological anatomy in the hands of Bichat and his successors and the introduction of the methods of percussion and auscultation of the chest by Corvisart and by Laennec, the "*Anatomie générale*" appearing in 1801, Corvisart's translation of Auenbrugger's "*Inventum novum*" in 1808 and Laennec's "*De l'auscultation médiate*" in 1819. The immediate result for medicine was the substitution, wherever possible, of the anatomical study and classification of disease for the old, purely symptomatic classification.

The power of the new methods and conceptions was speedily demonstrated by the discoveries of Bayle, Corvisart, Laennec, Bouillaud, Cruveilhier, Piorry, Louis, Andral, and others relating to tuberculosis and diseases of the heart and lungs and somewhat later by the work of Bright and of Rayer on diseases of the kidneys, of Bretonneau on diphtheria, and of Louis and his pupils on typhoid fever. The dangers of incomplete and too exclusive anatomical study of disease and of one-sided application of anatomical conceptions to clinical medicine were at the same time illustrated by the pernicious doctrines of Broussais. In the third and fourth decades of the century the significance, which today is so much and so properly emphasized, of physiological and chemical methods in the study of disease began to be apparent through the work of Magendie and of Liebig.

This most glorious period of French medicine culminated in the work of Louis, with whose name is associated especially the so-called analytical or statistical study of disease on both the clinical and the anatomical sides. Through the writings of Laennec and of Louis, and above all by that remarkable group of able and enthusiastic young American physicians who were students of Louis between 1830 and 1840, as the younger Jackson, Shattuck, Holmes, Gerhard, Stillé, Power, Swett, and Clark, the new medicine was introduced and soon spread in America. Although Swett was the pioneer in this city, Alonzo Clark was its apostle to this college, with which he became connected in 1841. His coming and that of Willard Parker, the year before, who began systematic clinical teaching, marked an epoch in the history of the college. The ablest and most representative American exponents of the fertility of Louis's analytical method of clinical study were Elisha Bartlett and Austin Flint. More original was the teacher of Swett and of Flint, Jacob Bigelow, who, although imbued with the new ideas, was neither the product nor the adherent of any special school, was a profound and fertile medical thinker of real genius, and with his colleague, James Jackson, the elder, shed great luster upon the Harvard Medical School.

By this time German medicine had broken the trammels of the philosophy of nature which bound it in the early part of the century. In Vienna Rokitansky, Skoda, and Oppolzer had advanced far along the path first opened in France; Schoenlein was developing the modern German clinic; the golden age of physiology marked by the work of Claude Bernard in France and of Johannes Müller and his pupils, Du Bois Reymond, Brücke, Ludwig, and others in Germany had begun, and soon after the middle of the century the cell doctrine had been made by Virchow the immovable cornerstone of pathology. Laboratories, that great contribution of Germany to scientific teaching and investigation, were established and rapidly developed during the second and third quarters of the nineteenth century, first for physiology, then for chemistry, pathology, pharmacology, and hygiene, anatomy being the fortunate possessor of laboratories centuries before. Mainly through her laboratories Germany secured about the middle of the century that leadership in medical science which soon turned to her universities the stream of foreign students.

The powerful influences of German medical science upon American medicine were not brought to this country by so compact a group of physicians or within so sharply defined a period and were not so immediately operative and are, therefore, not so readily traceable as the impulses from France which I have mentioned. They have, however, been the pervasive and dominant foreign influences of the last four decades.

American medicine owes a large debt to German physicians who have settled in this country, to such men as Engelmann of St. Louis and Detmold, who came in the thirties, especially to the men of 1848, brilliantly represented by our own Jacobi and Krackowitzer, and to many of a later period. Soon after the middle of the century their influence began to be distinctly apparent. During and after the sixties the stream of young American physicians returning from their graduate studies in German and Austrian universities introduced in constantly increasing measure those methods and ideals of German medical science which have so profoundly and beneficially influenced American medicine. To this direction of development an especially strong impetus was given in the late seventies and eighties by the rise of modern bacteriology following the discoveries of Pasteur and of Koch.

To Francis Delafield and later to T. Mitchell Prudden this college owes a debt of gratitude for the introduction of the new methods in teaching and for the establishment of a pathological laboratory under difficult material conditions. Dr. Prudden's dark tunnel of a laboratory replacing an ice-cream saloon in the old Twenty-third Street building marked the

beginning of that development of laboratories which has become so important a feature of the college in its new home and from which so much valuable work has issued. It is gratifying to record the moral and material support given to this movement by the alumni association of the college.

In directing attention, as I have attempted to do, to the successive periods in which Scotch, English, French, and German influences upon American medicine were especially noticeable, I would not have it understood that foreign influences at any time supplanted native forces. The names of many of those whom I have had occasion to mention testify that such influences enriched a soil already occupied with germinating seeds and did not breed mere slavish disciples. Many of our ablest and best physicians and surgeons, such as John Warren, Godman, Jacob Bigelow, Dewees, Drake, Torrey, the Becks, to mention only a few names of the early part of the last century, received their entire training in this country. Besides the impulses received from contemporary European medicine there have at all times been manifold and diverse circumstances which have influenced for good or for ill the development of medicine in this country, such as the material, political and social conditions prevailing at different times and in different places, the national habits, temper and ideals, the rewards of professional success, the qualities of those attracted to the profession and many other conditions which cannot be considered on this occasion.

We have our own educational and professional problems, peculiar to the special conditions of our country, and they cannot be satisfactorily solved by the transplantation of foreign systems, although we may receive guidance from the experience of older countries. Medicine has become cosmopolitan and we can no longer speak with propriety of exclusively national schools of medical thought and teaching. America is destined to make her own contributions to the world problems of education, science and art, and to repay the debt which she owes to other countries.

The elevation of educational standards in our better medical schools during the last quarter of a century has been most gratifying, and in this movement the College of Physicians and Surgeons has had a conspicuous share. Laboratory teaching has advanced from the weakest to the strongest position in the curriculum. The question may even be raised whether in some instances too much time may not be occupied by the instruction of students in laboratories, although I should be reluctant to concede this. I believe that at the present moment improvement in opportunities and methods of clinical training is a more urgent problem than the teaching of the so-called laboratory subjects. Something more than the amphitheater clinic or the ward class, useful as these are, is needed to furnish training in practical medicine and surgery analogous to that supplied by practical work in the laboratory and to make capable practitioners. To secure this, dispensaries and the public wards of hospitals must open their doors more freely to advanced under-graduate students of medicine, and I have recently in an address at the opening of the new Jefferson Medical College hospital endeavored to show that this can be done with advantage not only to the teachers and students, but also to the patients and the general efficiency and usefulness of the hospital.

I can wish no greater good fortune to the College of Physicians and Surgeons or indeed greater benefaction to the cause of medical education in this country than that it should come into possession of a general hospital of its own. Next to this is the establishment of such relations with public hospitals in this city as will render possible for its students such clinical training as I have indicated, and I understand that steps have already been taken to secure this result. The medical schools of New York, through failure to avail themselves more fully of the immense clinical opportunities of the public hospitals in this city, do not secure the full advantages of location which rightfully belong to them.

There are at least two important fields of study and practical work which are not as yet adequately represented in our medical schools. We greatly need psychopathic hospitals or wards attached to general hospitals, and also the establishment of well equipped laboratories where students and physicians can be trained in public hygiene. As regards the latter we are at present within a vicious circle. On one hand, there is little appreciation on the part of the public and of municipal and state authorities, indeed, I think, also of the profession, of the necessity of special training for those appointed as health officers, and, therefore, in lack of careers there is little encouragement to secure the training, and, on the other hand, skilled hygienists are so few that the value of their expert knowledge is not made sufficiently evident to the public. It does not seem possible that such conditions can long continue, and attempts to improve them have already begun. I do not know where more favorable conditions can be found for the establishment of a department of public hygiene to supply the training needed by those who wish to engage in public health work than in this city.

Upon anniversaries like the present attention is usually turned in the first instance to the past. The survey of honorable records and achievements supplied by the history of the College of Physicians and Surgeons is full of hope and encouragement for all of us interested in its welfare. As it enters in full vigor upon the second century of its existence, our college, fortunate in its vital union with Columbia University, looks forward with confidence to a future of expanding resources and ever increasing usefulness and power for good in the education of students, in the advancement of knowledge, and in the prevention and relief of human suffering and disease.

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DIAGNOSIS AND TREATMENT OF NEURASTHENIA.

By JOHN K. MITCHELL, M. D.,

Philadelphia.

Until a comparatively recent day lunatics were treated by chaining them in dungeons and beating them—with the approval of the medical profession. The neurasthenic patient to-day is treated by many physicians not with stripes, to be sure, but with ridicule or with a contemptuous summing-up of his case in a phrase: "There is nothing the matter, he is only nervous"—that is to say, there is nothing the matter except that every function of his mind and body is out of order, that he cannot walk or sit still, sleep, eat, think, read, write, or feel pleasure or pain in a natural way.

One hears doctors say with an air of modest pride that they know little of nervous diseases, and sometimes one inclincs to think the statement too limited! It is certainly true in some cases, since I can take from my case-notes of the past year the following instances of organic disease, all sent to me as "neurasthenias," viz: gastric ulcer, cancer of the pylorus, osteosarcoma of the vertebrae, general arteriosclerosis, dilatation of the heart, parenchymatous nephritis, and diabetes. If the list were to include nervous diseases, that blessed word "neurasthenia" would cover a multitude as with a diagnostic cloak and there could be added chronic alcoholism, ataxia, delirium tremens, paretic dementia, meningitis from sunstroke, and a number of forms of insanity, among them at least one of acute mania. The one particular in which these rather varied disorders resembled one another is that they were all "nervous" in some sense of the word.

To make a definition of neurasthenia at once brief and exact seems impossible, but I will start with an assertion and try to prove it: Neurasthenia is a chronic fatigue due in part to malnutrition, in part to functional over-exertion, occurring in persons with a predisposition hereditary or acquired.

Now as to diagnosis: Let us first consider for a moment the history of neurasthenia. The name is some forty years old but the disorder is ancient. Like appendicitis it formerly went under a hundred different names, according to its chief seat or chief symptom. After Beard's work one of the earliest clinical differentiations of it was in some reports of Weir Mitchell, Morehouse, and Keen in their work on "Injuries of Nerves" published after the Civil War, though their cases were traumatic in origin. They had projected a work, too, on "Acute and Chronic Exhaustion in War," the notes and case-records for which after lying long in Doctor Morehouse's office were burned by accident. Some of the causes are quoted in "Wear and Tear": "Severe marches, bad food, and other causes which make war exhausting were constantly in action until certain men were doing their work with too small a margin of reserve power. Then came such a crisis as the last days of McClellan's retreat to the James River, or the forced march of the Sixth Army Corps to Gettysburg, and at once these men succumbed with palsy of the legs. A few months of absolute rest and good diet restored them to perfect health." These few lines would make a suggcstive text for an essay on the diagnosis of neurasthenia, and in themsclves contradict sufficiently the new theories of treatment which would have us bclieve that neurasthenic conditions rest on mental or nervous bases alone. Here we have the usual, indeed the necessary combination of physical, moral and nervous causes—bodily labor, mental anxiety or excitement, imperfect nervous repair, or excessive nervous waste—finally a demand for more effort which the system is unable to spply, and the expected breakdown as a consequence. I should like to emphasize again my conviction that neurasthenia without preceding physical enfeeblement or malnutrition is most rare.

The demonstrations of Hodge and others have showed us that recognizable changes occur in the nerve centers from fatigue and suggest a possible theory to account for some at least of the conditions in neurasthenia, namely; that use of function may be so continuous or so severe as not to allow of proper repair, and that this in some way is a cumulative effect. In the same way, purely local overwork produces in the professional neuroses a condition which, though limited, exactly resembles the wider results of general neurasthenia—is, in short, a local asthenia. The well proven fact that only long and absolute rest from the performance of function will cure these cases adds further evidence that in them at any rate there is a form of nervous *exhaustion.*

The history of the causes and remoter beginnings of neurasthenia is not always easy to get at but is vital to satisfactory diagnosis. A "previous history" in extremest detail should always be taken. Sometimes this will not be possible without several cross-examinations. Endeavor to show the patient that matters which seem trifling to him may be of the utmost importance in his treatment or in the recognition of the true character of the ailment: You will have to listen to a great deal of futile and wandering talk, but out of it there comes now and then a fact or suggestion of value, and the character of the talk will often aid in understanding the person. It is a history of his mental and moral life, adventures and education, that is wanted, not only of his physical disorders or those which he conceives to be his nervous symptoms. Nearly always there will be found in different combinations the same causes—moral or mental strain and physical over-effort or wrong use of forces. Next the diagnosis will rest on certain subjective symptoms which fall into three or four major groups and a host of subsidiary or secondary symptoms.

First and most important are the *fatigue symptoms:* general weariness, lassitude constantly present, grcatly increased by the smallest exertion. The weariness is not relieved by rest. Some patients feel all effort, mental or physical, as *pain,* occasionally rcferred to parts not related to the function used, as in a man latcly under my care who had pain in both knees when he read.

The second group includes the symptoms of *irritable weakness,* nervous, motor and sensory; for example, increased reflexes, cardiovascular disturbances, muscular tremor, excessive emotionality.

The third group comprises the *disorders of the will,* such as lack of selfcontrol, indecision, inability to originate thought, or to hold to a line of thought. Sir James Paget stated this cardinal symptom epigrammatically: "The patient says she cannot; the nurse says she will not; the fact is she *cannot will.*"

Fourth comes *psychic depression* and anxiety or fear symptoms: Sometimes there is simple depression, sometimes definite fears or "phobias," nearly always there is some peculiar sense of "anxiety," praecordial, cerebral, or abdominal, which makes one of the chief distresses of which the patient complains. This last group has been separated by some diagnosticians into a distinct class, as "psychasthenia," but to my thinking it is too closely interwoven with the preceding ones to be so set apart.

These group-symptoms overlap and run into one another but they constitute the positive pathognomonic signs. Some or all of them must be present for a diagnosis. Negatively there is a fifth very important symptom, namely, the absence of any typical or peculiar organic changes. Lastly, there is the *state of mind* of the patient. You know the lady from New England said proudly that Boston was "not a place, but a state of mind." Neurasthenia is less a disease than a state of mind. The "state of mind" is difficult briefly to describe but it may be said to have as elements the depression, the intellectual fatigue, the generally distorted and exaggerated view of oneself, one's symptoms, and one's relations to the world outside, the emotional tendencies, and in each case some peculiar individual neurasthenic idiosyncrasy. Diagnostic investigations must take account of this as well as of the cardinal symptoms. Leaving aside the small number of patients who have undergone tremendous strains, physical, nervous, or moral, as a preparation for nervous breakdown, one might almost say that neurasthenia is only possible in persons who lack mental balance or rather all round development, who are deficient at any rate in that faculty of correctly relating conclusions to premises which we call logic—minds which are, with respect, of the feminine type. Lastly, as time is wanting to describe all the secondary symptoms, it may be said that the very multiplicity of them, their unrelated and often contradictory characters, help to a decision. To sum up, the characteristics of neurasthenia are a peculiar mental state, chronic fatigue, indecision, psychic depression, irritable weakness and an absence of objective symptoms.

Differential diagnosis should present but small difficulties, for although neurasthenia runs on the one side into hysteria and on the other into insanity and some of the degenerative nervous changes, only two distinct diseases are likely to be confused with it if proper diagnostic caution be used. These are early locomotor ataxia and early paralytic dementia. The lost reflexes, the character of pain, and the eye-symptoms should suffice to distinguish the former, and the mental symptoms the latter. In dementia, however, the typical mental symptoms are often only to be discovered by long and repeated examinations, hence an off-hand diagnosis is not always possible. Besides these it is worth remembering that the presence of fever, not uncommon in irritable neurasthenics, may set up a question, though the temperature is not so high nor the occurrence of fever so common as in hysteria, and that dizziness, vertigo, and various vasomotor disturbances are sometimes marked enough to color the whole picture and produce an effect of being themselves the chief troubles. I believe really one of the main causes of mistaken diagnosis in neurasthenia arises from the preponderance of one set of symptoms to an extent which obscures or lessens the apparent importance of the essential symptoms. Still, as is evident from the list of cases above given, the mistake is more often the other way—not that neurasthenia is not recognized when present, but that other diseases are called neurasthenic because they present some of its proper symptoms.

From hysteria, except when the two are actually mingled, diagnosis should be possible by the absence in neurasthenia of crises, paroxysms, emotional storms, paralysis, contracted visual fields, and anaesthesias.

This brings us to the important and most interesting question of treatment. The indications seem obvious: to repair the damages caused by overexertion, to get rid of the depression and to combat a host of lesser but distressing symptoms, from asthenopia to constipation, and last and most serious, to strengthen the will and to control and change the mental habit. Not to stop by the wayside for argument it may be said that the first requirements are met by rest or rather by rest-treatment and the latter by a rational system of education of the will, the logical faculty, and the reasoning powers of the patient.

I need not dwell on details of the rest-treatment save to say that the kind and amount of rest should be regulated to the special needs of the case, varying from a couple of hours' quiet to long continued complete recumbency. In slighter cases it need not include isolation. In the more severe instances, and especially when there is much depression or much tendency to emotional display, isolation should be rigid and rest absolute. Déjérine, who has been very successful in Paris with rest-treatment, insists so much on the isolation feature that the method has acquired the name of "isolation-cure" there. A different point of view is suggested by the Germans calling it *Mastkur*—fat-treatment. Besides the exact carrying out of details as to food, rest, massage and so on, in practice much will be found to depend upon the personal factor, the influence of the physician upon the patient. Unless the patient's confidence and active, even if not cheerful, cooperation can be assured the treatment will be far slower and less successful than if faith and hope fight on his side.

It is desirable, though not absolutely necessary to success, that the patient believe, is convinced, that a cure will be effected. How this conviction is planted in the brain is a detail. It is best to try to do it by an appeal to reason, gradually educating the reason to the comprehension of the idea.

But it has been done by pomp and circumstance, by candles and incense, by plunging into the pool of Lourdes, by laying on of hands, by ceremonious administration of drugs, in short, by all sorts of appeal to the feelings and emotions, and by all forms of suggestion from High Mass to blue mass!

I have never been so well satisfied with the results in hospital-wards, or even in private rooms in a hospital, as with those attained outside of institutions. This is partly due to the more direct and personal contact with patients outside of an institution, partly to the added effect of the constant and useful aetivity of a special nurse, who, if loyal, tactful, and intelligent, should keep up the invigorating, cheering, hope-inspiring influence of the physician in the intervals of his visits. There is no time to go into the details of the physical treatment here, and it is my intention to preach my sermon on the mental aspects of the treatment, as less well known than the physical part.

At the very beginning the patient should be encouraged by a clear and untechnical statement of the ailment and of what is to be expected from treatment. It may be neeessary to repeat this many times in the first days, the patient's mind not usually being very receptive and, indeed, preoecupied with his own ideas of his disorder, and distracted by pains and depression. It is not wise to say much about the need of self-eontrol, of a reasonable point of view, the suppression of extravagance in statement, or of exaggerated displays of feeling. Let these things dawn upon the patient gradually as nervous strength and mental equilibrium improve. At a very early stage, however, it *is* best to refuse to hear any reiteration of the tales of woe to whieh at first and more than onee you have, of course, listened patiently—but explain why you thus refuse, making clear if possible that such repetition is bad for the sufferer, confirms the idea of pain or whatever the complaint may be, and keeps it before the mind unwholesomely.

One symptom very trying to persons who are not so sunk in neurasthenia as to have forgotten their selfrespect (a loss less likely in this disease than in hysteria) is the disability of will and deeision. A bed-treatment, with scheduled hours and a settled routine, does away with all need of decision, and as strength grows this faculty begins to regain power—but even then it will need help. One may point out to patients the effects of habit, explain the psychology of the will, and show them that to break a bad habit a good one must be formed; for example, make elear to them that when they have a choiee to make it must be made and *held to,* even if it be only a question of elothes or food.

When improvement is well under way is time enough for reproof and exhortation. Until then let there be advice and eneouragement and helpful counsel. And, by the way, the nurse's duty is to carry out orders, not to be an instrument of discipline—that should be in the physician's hands, to be used with judgment. When one does have to scold it should be hearty and distinct and on one point at a time. The moment, too, must be selected and fitting. Sometimes when no impression seems to be made on the patient by the verbal statement of faults or shortcomings, a brief letter, friendly, of course, but decided, will have a great effect. The same is true of encouragement which is sometimes more deeply felt when written—and patients oceasionally demand a written statement on some point of recurring doubt or fear—and this should be given without hesitation and truthfully.

Before I close, a few words must be said on a very vital point—the after treatment of neurasthenic cases. After the prescribed treatment of rest, whose length must be determined by results, not by any preconceived views, though one may very well set a minimum bed-stay of four weeks as the shortest likely to do any real good, the patient must be kept under observation and in touch with the physician for months. No matter what the gain in flesh and strength may have been it is not firmly established until six months or even a year is past. During this time patients should be gradually trained into hard physical condition, with constantly increasing amounts of exercise. It is desirable, where it can be managed, to get during this time one or two total changes of climate and surroundings; for instance, a month at the seashore, a couple of months in the mountains, or, in the young and able, a couple of months of rough cruising or camp life. Often I change at this time the nurse who has been through the bed-treatment for another, or in men substitute a eapable companion of the patient's own class and education for the nurse, invested, be it said, with authority, engaged by and responsible to the physician. An intelligent medical student or recent graduate hunting a job that will start him with a little lining to his pocket against the lean years of beginnings, is my usual choice—seldom a friend of the patient's; never, if it can be helped, a relative.

Wise it is, too, and helpful to the patient, to ask for a written report from the patient's self every month.

I learn from some recent publications that to treat patients in this fashion, to believe that they are rational beings, and let them perceive the belief, to encourage the depressed, to inspire the pessimistic with a hopeful attitude, in short, to behave like a reasonable human creature dealing with reasonable creatures is "psychotherapy." Like the French bourgeois who had been writing prose all his life without knowing it, I have ignorantly been practicing psyehotherapy and never knew it.

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ABSCESS OF BONE CAUSED BY AN "INTERMEDIATE" BACILLUS (B) ALLIED TO B. PARATYPHOSUS.

By F. G. Bushnell, M. D., D. P. H.,

Pathologist Sussex County Hospital, England.

G. T., aet. 41 years, was admitted to the Sussex County Hospital, under the care of Mr. R. F. Jones, F. R. C. S., on May 25, 1907, for acute suppurative periostitis. There was a history of a mild attack of "typhoid" fever five weeks previously, when under the care of Dr. F. S. Beachcroft of Petworth. The bone affection came on during convalescence. The past illness was attributed to eating whelks bought off a barrow ten days before the onset of the disease; and this food stuff also caused sickness and diarrhoea in other members of his family. There was diarrhoea during the first five or six days only, "rose spots" were present, and on the twelfth or fourteenth day the Widal reaction to typhoid was negative. Pain in the ankle and leg came on during convalescence.

On examination there was a tender, fluctuating swelling the size of a bantam's egg on the front and centre of the left tibia. This was incised and about 100 cc. of pus evacuated from beneath the periosteum. The wound healed rapidly.

Bacteriological Report. Pus from the abscess contained Gram negative bacilli. Inoculated on broth there was uniform turbidity in 24 hours at 37° C. due to a motile, slender Gram negative bacillus in pure culture. Gelatine 24 hours at 22° C. shewed numerous transparent surface colonies with rounded or irregular margins, not liquefying the jelly. On Conradi-Drogalski medium small transparent colonies grew. The bacillus measured 0.5 to 1 or 2μ, formed a moist grey growth on agar at 37° C., formed no spores, no pigment and possessed no proteolytic powers; it fermented levulose, galactose, dextrose, maltose, dulcit and mannite with gas formation; lactose, raffinose and sucrose being practically unaffected. Milk was acidified and clotted in 48 hours, on two occasions remaining so for 3 months. On one occasion it was rendered alkaline. No indol was formed and shake taurocholate neutral red agar shewed no appreciable yellowing. As the typhoid bacillus does not coagulate milk and renders glucose acid without the formation of gas, this is classed generally as paratyphoid (with anomalous and variable powers of affecting milk). Subgroups of the paratyphoid (known also as the Hog Cholera, paracolon, Gärtner and intermediate) are formed by the reactions with milk. Thus, the ordinary form shows an initial acidity followed by alkalinity in 2-10 days. These correspond to Buston's paratyphoid β, which resembles the paracolons in culture and paratyphoid α, which is unlike them, though both cause typhoidal symptoms.

Ford similarly subdivides the paratyphoid bacilli by the use of xylose and arabinose into the Hog Cholera which cannot ferment these carbohydrates, and those parasitic to men (icteroides and paratyphoid), B. *enteritidis Gärtner* and some dysentery and cattle disease which can. (Comparative tests were made with paratyphoid α and β O 4 Buston in the Ralli Laboratory and with Schottmüller, Gärtner and others).

The serum reactions of the patient were highly significant. His serum was on three occasions negative to *B. typhi,* once during the first illness and twice during the bone affection in 10 per cent dilutions. On the other hand it was positive in 1 per cent dilutions in 30 minutes to Schottmüller, to paratyphoid α O 4 Buston and Gärtner, but negative to *B. coli.* On three occasions the bacillus agglutinated at once completely with 1 per cent dilutions of the patient's serum.

Remarks. Though paratyphoid is not uncommon in Sussex, a bone abscess due to a paratyphoid bacillus is rare and not recorded. Castellani records an intermediate bacillus coagulating and acidifying milk isolated from a case of appendicitis and giving a marked serum reaction. The sudden onset of symptoms of poisoning by other members of the family after the eating of the shell fish is comparable to the meat poisoning caused by *B. enteritidis Gärtner.* In this patient invasion of the system by bacilli occurred. Diagnosis would be facilitated if paratyphoid bacilli were used in serum diagnosis when there was a negative typhoid Widal's reaction. Cushing isolated his bacillus O from an abscess following "typhoidal" disease, and this was erratic in its alkali production in milk, as was this bacillus.

SUDDEN DEATH IN PLEURISY WITH EFFUSION DUE TO A CHANGE OF POSITION.

By W. J. Calvert, M. D.,

University of Missouri, Columbia, Mo.

The comprehensive papers of Leichtenstern[1] and Weill[2] review the recorded cases and classify the causes of sudden death in pleurisy. Since Weill's paper appeared, a number of cases have been reported. Leichtenstern discredits Bartel's idea that the flow of blood through the inferior cava is obstructed by a right-angled kink in the vein. His classification is as follows:

1. Thrombosis of the pulmonary artery; thrombi in the right auricle, ventricle and superior cava.
2. Apoplexy.

3. Cases in which at autopsy no positive cause can be found.

4. Various causes such as:

(a) Rupture of an empyema into a bronchus.

(b) Amyloid degeneration associated with chronic empyema.

(c) Haemorrhage from an injured intercostal artery.

(d) Rupture of an aneurysm displaced by left effusion.

(e) Epileptic cramps due to irrigation of the pleural cavity, etc.

To these Weill calls especial attention to myocardial changes. More recently, Hutton[3] concludes from some experiments on rabbits that the heart, in left effusions, rotates to the right so as to compress the inferior cava; and, in right effusions, the cava is stretched by descent of the diaphragm and compressed by the effusion. Both of these factors tend to diminish the flow of blood to the heart.

After reviewing the available literature, it seems that a large number of these cases are included in class three (Leichtenstern), and that the interest in the subject depends less on its explanation than on its prevention, especially when the frequency of pleurisy is considered. The possibility, then, of preventing sudden death in pleurisy warrants renewed investigation until the subject is explained in all of its details.

In the light of some recent observations on pericarditis with effusion and pleurisy with effusion, it is thought that in some of the cases, included in class three (Leichtenstern), an explanation of the mechanical factors involved can be explained. Some of which may be of clinical importance.

Factors involved.—The pleural pressure is composed of two factors (mentioned by Leichtenstern): (A) The pressure with which the fluid is forced into the pleural cavity. At any given time this pressure is constant, in that it is not affected by a change in position of the patient, it only changes as the activity of the lesion changes. (B) The hydrostatic pressure caused by gravity. This factor varies with the height of the column of fluid and is greatest at the bottom of the cavity. The degree of pressure exerted by (B) varies with the change of position of the body.

The first factor (A) may be designated as the constant or pleural hydrostatic pressure and the second (B) as the variable hydrostatic pressure. Naturally (A) varies from time to time. While the quantity of fluid remains fairly constant, (B) remains, for a given point and position, constant, so may be called a constant variable.

The total pressure on a given point is equal to the sum of the pleural factor and the variable for that point. As (B) varies for each point in each position of the body, it is clear that the pressure in the pleural cavity must vary by an amount equal to the variation of (B).

1. The variable for the inferior cava. The variable, factor (B), is the pressure of the column of fluid, patient sitting, from the surface of the fluid in the pleural cavity to a given point on the inferior cava, minus the pressure of the column of fluid, patient lying, from the surface of the fluid to the same point on the inferior cava. If the pleural cavity is full of fluid, these columns would be represented, in sitting posture, by a perpendicular line passing from the apex of the cavity to a horizontal plane which passes through a given point on the inferior cava, and, for the lying position, by a perpendicular line passing from the highest point of the anterior surface of the pleural cavity to a horizontal plane which also passes through the same point, as above, on the inferior cava. The variable is represented by the difference between the lengths of these lines.

2. The venous pressure is caused by the pleural pressure exerted on the venae cavae and heart. It must remain above the pleural pressure until the maximum venous pressure is produced; when, if the pleural pressure continues to increase, the latter must become equal to and then greater than the venous pressure. As the pleural pressure approaches in degree that of the veins, the latter must be more or less constricted; and collapsed, as shown,[4] when the pleural pressure is greater than the venous. Venous compensation has failed and death follows.

On account of the anatomical difference in the arrangement of the venae cavae and heart with respect to the two pleural cavities, each will be separately considered.

Right side.—A large surface area of the venae cavae and the right heart is directly exposed to the pleural pressure. The mechanics of the collapse of the venae cavae and right heart have been shown.[5]

Condition I.—The maximum venous pressure (save as heretofore modified) has been produced, represented in Fig. 1, by the line *AB*. The pleural pressure on the inferior cava is represented by the line *CD*. In the sitting posture, the variable *DE* is added to the pleural pressure, giving a total pressure on the inferior cava represented by *CE*, which is almost equal to the maximum venous pressure. But, in the sitting posture, the increased height of the column of blood in the cava from the diaphragm to the right auricle adds a factor of pressure represented by the line *AF*, Fig. 1. Consequently the venous pressure remains higher than the pleural, by an amount represented by the difference in levels of *E* and *F*, Fig. 1. The veins remain patent.

Condition II.—When the pleural pressure is further increased, nearly equal to that in the inferior cava, Fig. 2, *CD*, the vein is more or less constricted. On assuming the upright position, the variable *DE*, Fig. 2, is added to the pleural pressure, making the total pressure, *CE*, Fig. 2, greater than the venous pressure which, now, is composed of the original pressure *AB*, the factor *AF*, and the resistance due to the sudden stoppage of the flow of blood, *FG*, Fig. 2, due to the collapse of the inferior cava. At this stage the pleural pressure *CE* is greater than the total venous pressure, *BG*, Fig. 2, so the inferior cava must collapse. This change in the flow of blood to the heart is sufficient to explain the associated clinical symptoms, such as dyspnoea, irregular pulse, etc. When the flow of blood from the inferior cava to the heart is blocked, the pressure in the upper portion of the pleural cavity, less than that in the lower portion, permits the blood to flow from the superior cava to the auricle until the pres-

sure in the cava becomes less than that in the pleural cavity, when the superior cava is also collapsed. Now the heart in one or two beats empties itself and is collapsed between the pressures in the two pleural cavities. A general anaemia is produced; the patient becomes unconscious and falls to the horizontal position. The variable is, now, subtracted; the venous pressure, again, becomes greater than the pleural, and forces blood to the right auricle. The venous pressure must overcome the inertia of the two pleural cavities, after which the auricle is partially distended and permits blood to flow

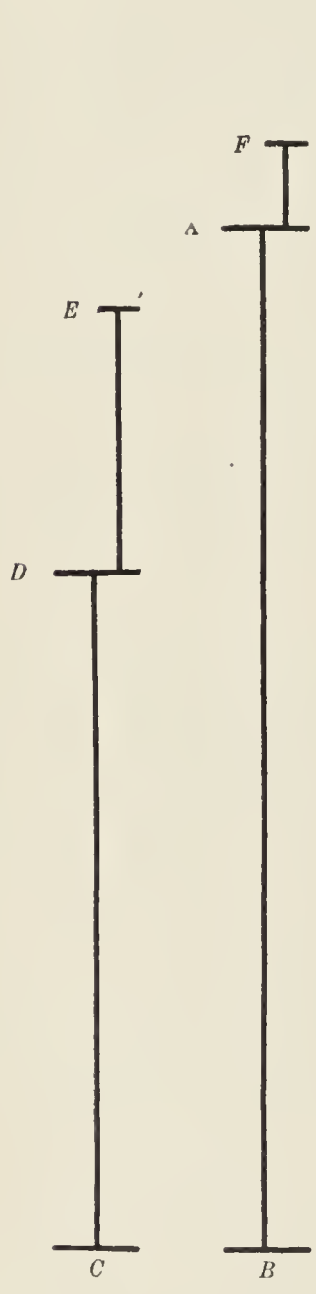

Fig. 1.

Fig. 2.

to the right ventricle, to the pulmonary vessels, and possibly to the left heart. Owing to the anaemia of the heart, due to the small amount of blood received while the organ beat the last few times, the anaemia while it was collapsed, and the cessation of respiration while the blood was flowing through the lungs after the patient assumed the horizontal position, the heart muscles are too much exhausted to receive the stimulus caused by the partial distension of the large veins at the auricle; or if the stimulus is received, the power of conductivity of the heart muscle is not sufficient to transmit the stimulus to the ventricles. In this latter case, a few auricular beats might occur. But receiving no arterial blood, the heart muscle would quickly become insensible to further stimulation. Death is the result.

At autopsy, the veins should be open and the heart should contain more or less blood. This condition is confirmed at autopsy.

Condition III.—Various degrees of pressure between those mentioned in conditions I and II may successively develop. These varying pressures would produce varying degrees of venous obstruction which would cause symptoms ranging in intensity from slight dyspnoea to profound unconsciousness, from which the patient would revive on falling to the horizontal position.

Left side.—On account of anatomical relations, only in a portion of the cases will an extensive area of the inferior cava be directly exposed to the pleural pressure. In these cases the effect of sitting up would be the same as above described. But when the cava is only slightly exposed, the effect would be minimal and the vein only slightly obstructed. The column of fluid affecting the heart would be slightly increased. This would cause a slight increase of pressure on the heart which with the effect on the vein would tend to further compress the heart and shut off the flow of blood. In order to get the greatest effect of this change of pressure the pleural pressure would have to be more nearly equal to the venous pressure than was necessary in the right side. If the veins were just about to be closed by the pleural pressure, the slight increase on the left side would have the same effect as described for the right. If the difference of pressures was greater, the result would be syncope. Clinically, it has been found that fatal effects from left effusions were less frequent than from right (Leichtenstern).

On the first thought it would appear that so slight a change in pressure, as represented by the variable, could not produce so great a change in the circulation. But it must be remembered that the venous pressures are nearly zero under normal conditions and are not subject to great changes in pressure. So when expressed in percentage, the variable would be relatively great. Again, coming at the time described, the variable is the balance of power which, often insignificant in itself, determines subsequent conditions.

Pathological Conclusions.—Sudden death in some cases of pleurisy with effusion, on changing position, is preceded by dyspnoea, irregular pulse, and general anaemia caused by collapse of the venae cavae and heart; and is due to failure of the venous congestion to compensate the constant variable hydrostatic pressure.

Clinical Conclusions.—1. Dependent as it is on one physical factor (pleural pressure) the venous pressure affords a reliable sign of the intrapleural pressure. Changes in the degree of venous pressure show the activity of the lesion producing the effusion, either increasing or decreasing, especially after the walls of the cavity are stretched. Maximum venous pressure heralds the approach of a period of unstable venous compensation, or the beginning of a failure of the veins to compensate. During this period the patient is exposed to attacks of syncope, sudden death on changing position, or to

sudden death from a rapid rise of factor (A) of the pleural pressure.

2. During this period the necessary precautions should be taken to prevent unnecessary change in the position of the patient—a horizontal position should be maintained.

3. Maximum venous pressure is a signal for immediate interference, tapping.

4. The importance of the venous pressure suggests a general application, by clinicians, of the present methods for measuring venous pressure, to all cases in which venous congestion is present, for the purpose of determining the range of pressure in each pathological condition.

5. In cases of sudden death, the clinician should remember the success following continued stimulation of the heart in experiments in physiological laboratories, when the heart has failed; and should apply, over a number of hours, and so far as possible, the same measures to the human heart. By so doing, a portion, at least, of these cases might be saved. The first step is to reduce the pleural pressure and increase the venous. Turning the patient on the affected side and nearly in a perpendicular position, would serve to transfer the variable from the cava to the outside wall of the pleural cavity and to add to the venous pressure the column of blood in the large veins. This change in pressure would add much to the effective force of the venous pressure, and might, with the aid of the stronger heart stimulants, revive the heart. Artificial respiration would, at least, slightly change the small amount of blood which might be forced through the lungs to the left heart. At this stage arterial blood would materially aid in further reviving the heart. If by these means the heart begins to act feebly, the next step is to remove a little fluid from the pleural cavity, a few cubic centimeters. If too much fluid is removed the heart will not be able to do the increased work. As the heart is better supplied with blood and increases in strength, more fluid can be withdrawn. Repeated withdrawal of small amounts of fluid, until the venous pressure falls below the maximum pressure, is indicated; after this the heart is better supplied with blood and more capable of performing its increased work. Later the fluid may be withdrawn in larger amounts.

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PROCEEDINGS OF SOCIETIES.

THE JOHNS HOPKINS MEDICAL SOCIETY.

October 7, 1907.

The meeting opened with the election of Dr. J. M. T. Finney as president and Dr. R. I. Cole as secretary of the society for the ensuing year.

I. Exhibition of Cases. DR. EMERSON.

Dr. Emerson reported three cases where the patients had received small doses of thyroid extract to arrive more certainly at a diagnosis of Basedow's disease. The principle is, that by feeding a patient who possibly has Basedow's disease with very small doses of thyroid extract, an outspoken condition of exophthalmic goitre may result. Heretofore clinicians have always used thyroid extract in large doses for an immense variety of symptoms and diseases and they have studied its effects pretty thoroughly. In so doing it they noticed that some patients suffered from the effects of the drug even after small doses. This event suggested to Dr. Emerson the possibility that such patients were perhaps affected with an unrecognized exophthalmic goitre.

Case I was that of a man, 24 years of age, who came under observation complaining of nervousness and loss of weight. His cardinal symptom was a constant, ill-defined feeling of apprehension of impending disaster. He had no tachycardia, no struma and no tremor. He had positive Von Graefe, Moebius and Dalrymple eye signs. He was accordingly given 5 grains of thyroid extract, three times a day for three days. After the first dose there was an immediate increase in the pulse frequency which continued until it had reached 120. Upon cessation of the medication the tachycardia and increased nervousness continued. The patient underwent a partial thyroidectomy which resulted in the disappearance of his symptoms and recovery of his weight. This case seemed to be a positive therapeutic test of the existence of Basedow's disease.

Case II, a female, aged 20, was admitted to the hospital, complaining of pains throughout the body and nervousness. She had been in this condition for two years. She had exophthalmos and a positive Von Graefe's sign. After the first small dose of thyroid extract her pulse dropped to a very low point. Medication was discontinued and the pulse returned to normal. The dose was then repeated with a consequent drop in the pulse, which remained low. Here the result was the reverse of that in case I. The thyroid remains free and the eye symptoms are indefinite. The case resembles myxoedema more than Basedow's disease.

Case III, a female, aged 30 years, was admitted to the hospital complaining of palpitation of the heart, night sweats, weakness, and feelings of apprehension and dread that have continued during the last five years. She had a fulness of the neck for eight years, which has not increased in size. Her pulse was about 100. Upon the administration of 5 grains of thyroid extract, three times a day, her pulse rose at once and fell soon after the dose was stopped. This was a positive

test. This test has been made in 21 cases: in cases not suspected there have been no results. In certain cases, those of chronic nephritis among them, there has been an increase of the pulse and positive eye signs. In cases with enlarged gland the result has been positive.

Discussion.

Dr. MacCallum.—There is an idiosyncracy to thyroid extract. It is agreed that there are certain effects in every case of thyroid extract feeding. The pathological changes in case I were not absolutely characteristic of exophthalmic goitre. The pathological test must be important.

Dr. Barker.—I am convinced that thyroid extract is of some help in clearing up the diagnosis at times, especially when there is no tachycardia. Iodo-thyrin or iodin will act in the same way. Bear in mind that intolerance to iodin may be a sign of Basedow's diseases. The psycho-neurosis is of vast importance in diagnosis and is suggestive if met with. Many patients come in, complaining of psychasthenia or neurasthenia and on removal of one half of the thyroid patients are rid of the symptoms. In a certain proportion of cases the symptoms are due to a thyreosis.

II. Anuria and Nephrostomy by the Ureter. Dr. Kelly.

Dr. Kelly reported a case of anuria which he had treated by a new method—that of ureteral catheterization.

The term anuria is widely applied to cases whose cause is not so obvious. Real anuria is quite rare. A tumor, more particularly a sarcoma of the pelvis may cause true anuria. A post-operative anuria occurs if the ureter be accidentally tied off. Where only one kidney exists much graver symptoms supervene.

The particular case reported was that of a woman, aged 32 years, who underwent a hysterectomy for cancer. There was unusual handling of the ureters at operation. A post-operative cystitis occurred, characterized by much pus and B. coli in the urine, and a uretero-vaginal fistula developed. There was a rapid recurrence of the tumor especially in the broad ligament on the right side. On March 4, the left kidney was secreting twice as much as the right. Analysis of catheterized specimens showed 2 to 3 per cent of urea from the left kidney, but only 0.12 per cent from the right. The specific gravity was 1030 for the specimen from the left kidney, 1003 from the right. There was pus from the right kidney. It was accordingly believed that the right kidney had been almost entirely destroyed and operation was decided on. The right kidney was removed through a posterior lumbar incision. It was three times its normal size and completely destroyed. Gradual anuria from the left kidney ensued. The urine became of a very foul odor. On March 21, there was no urea in the specimen. Ordinary therapeutic measures proved futile. There was a terribly fetid pus that came from the bladder. Since there was no pain, it was to be assumed that no pinching off of the ureter had occurred. The patient's mental condition was excellent, but she had general anasarca.

In the hope of stimulating secretion the left ureter was catheterized. There was an immediate secretion: 15 cc. in the first minute; after 10 minutes, 10 cc. to the minute; for the first hour, an average of 8 cc. to the minute. This urine was clear and normal. For the first five hours there was 2200 cc. of urine with a urea content of 16½ grammes. The catheter entered easily, indicating no obstruction. When the catheter slipped out there was immediate suppression. On re-introduction of the catheter an obstruction due to cancer was found at the vesical end of the ureter.

From March 21, to April 20, the kidney secreted enormously and the anasarca disappeared. The patient developed a B. coli and pyogenic infection, and finally succumbed to her disease. She was always comfortable with the catheter in place.

At the conclusion of Dr. Kelly's talk, Dr. Burnham discussed the etiology of anuria. In general the cause may be traced to one of four conditions: obstruction in the urinary tract; local conditions of the kidney such as nephritis, etc.; an angio-neurosis; or a general circulatory disturbance. In any case of anuria, after trying ordinary measures without avail, we should employ ureteral catheterization as a diagnostic or a therapeutic measure.

III. Eclampsia without Convulsions. Dr. Slemons.

Published in the Johns Hopkins Hospital Bulletin, November, 1907.

October 21, 1907.

Dr. Finney presiding.

I. Presentation of Cases. Dr. Cushing.

Dr. Cushing exhibited a patient, a young woman who had received a severe injury of the head in an automobile accident. Immediately after the injury, the patient showed symptoms of concussion of brain, but she recovered from these within an hour, when she became conscious and responsive though nauseated and complaining of headache. At this time her pulse was not slowed and there was no oedema of the eye grounds: her systolic blood pressure was 115 and she was vomiting. During the next forty-eight hours symptoms of increasing intra-cranial pressure developed and fracture of the base of the skull was definitely diagnosed. On the third morning after the injury the patient showed marked oedema of both eye grounds, was bleeding from the left nostril and left ear, and had a left hemi-facial palsy. Dr. Cushing now performed a subtemporal decompressive operation, finding at operation a sub-dural as well as an extra-dural clot together with fluid in the sub-arachnoid spaces. He evacuated this and left a drain to the sub-dural clot. Very soon after operation the symptoms disappeared. After removal of the drains a cerebro-spinal fluid leak persisted for ten days, when the wound was closed. Three hours after closure there was beginning oedema of both retinae. At present there is a considerable protrusion of the soft parts at the site of operation, but Dr. Cushing does not doubt that if operation had not been

resorted to, the patient would still be having pressure symptoms.

Dr. Cushing reported a second case that developed pressure symptoms after injury to the head, where the same operation was performed and the patient became normal four or five days after operation and has remained perfectly well since. This year he has performed the decompression operation almost invariably after fracture of the base because nearly all the symptoms are due to intra-cranial pressure.

The important considerations in this procedure are that it gives the surgeon a definite way of attacking what have been heretofore considered pretty hopeless cases—fracture of the base with haemorrhage. Dr. Cushing thinks that except in very serious laceration of the brain the outcome after decompression will be more favorable. The subtemporal route is advantageous because it discloses the more frequent haemorrhage from the middle meningeal and it is the tips of the temporal lobes that are most likely to be lacerated. Heretofore the post-traumatic neuroses were distressing features after recovery from the injury: most neurologists believe that decompression is most apt to do away with their occurrence. In the past, eighty per cent of the patients with basilar fracture in the Johns Hopkins Hospital died. Better results are to be looked for with operation.

Discussion.

Dr. Thomas, *Boston.*—Our experience in Boston has been practically the same. Any decompressive operation has been followed by relief from pressure symptoms. I think that Dr. Cushing's idea of preventing post-operative neuroses is too optimistic. I have seen many peripheral nerve injuries after basal fracture. I have seen right sided palsy of the third nerve, together with complete optic palsy, the third nerve getting well.

II. The Effect of Pressure on the Stethoscope on the Intrathoracic Sounds. Dr. Chas. P. Emerson.

The speaker emphasized the importance of pressure exerted on the stethoscope during auscultation in changing the intensity and the quality of the heart sounds. In some cases of myocarditis with rather faint heart sounds, these cannot be heard if even a slight pressure is made against the bell of the stethoscope, but are distinctly heard if the instrument merely rests on the chest wall. The same thing is well recognized by those who listen for the foetal heart beat, since they almost without exception place the unaided ear against the mother's abdomen.

In explaining this, the speaker emphasized the difference between the transmitted sounds, which are always faint, and the sounds produced at the surface of the chest and abdomen, which act as a sounding board. The latter sounds are dampened by the pressure of the stethoscope. Some sounds, especially the blow of aortic insufficiency and the high pitched râles, are better heard if a little pressure is exerted, since for them one must depend on transmitted sound. The rumble of the Flint murmur and that of slight mitral stenosis is easily dampened by a little pressure.

The properties of the chest as a musical instrument were illustrated by the metallic tinkling of pneumothorax. As a rule these sounds are distant and very faint; while in rare cases they can be heard at some distance from the bed of the patient. Some heart murmurs can be heard at times even across the room. This striking intensification of the sounds is without doubt due to the chest acting as a consonating cavity. The effect of the chest in resonance is well heard in amphoric breathing.

Lastly, the speaker emphasized the importance of the shape of the bell of the stethoscope in modifying the sounds heard.

III. A Lantern Slide Demonstration of the Hystopathology of Experimental Urticaria Factitia. Dr. Gilchrist.

Dr. Gilchrist gave a lantern slide demonstration of the microscopic features of urticaria factitia. He examined 15 cases of the disease, producing the artificial wheal by drawing down the finger nail or the blunt end of a pencil rather sharply over the skin.

A portion of the wheal was excised usually after 10 or 15 minutes had elapsed. In two cases of spontaneous wheals sections were taken after 5 hours' and 24 hours' duration. In one case portions were excised after 2, 5, 8, 15, 25, 40, and 60 minutes.

Sections of the wheals from the severe cases showed: marked oedema of the connective tissue and of the connective tissue cells; profuse emigration of polymorphonuclear leucocytes from the venules of the papillary and middle layers of the corium, and in some cases as deep as the subcutaneous tissues; pronounced fragmentation of polymorphonuclear leucocytes and fixed connective tissue cells; emigration of lymphocytes, apparent increase in the number of mastzellen; and swelling of the cells of the sweat glands. The lymphatic vessels were markedly dilated, especially deep in the corium and near the periphery of the wheal. The fragmented nuclei seem to be taken up by the lymphatics. The epidermis remained practically normal.

Sections from older wheals (one hour) did not show as much fragmentation, but still many polymorphonuclear leucocytes were scattered throughout the tissue. Sections from milder cases showed a much less severe type of the same phenomena.

In one severe case of urticaria factitia where the wheal was excised after two minutes had elapsed there was present fragmentation of nuclei which seemed to demonstrate death of cells preceding the inflammation. In another case the polymorphonuclear leucocytes were nearly all fragmented almost directly after leaving the blood vessel. In nearly all the cases the wheals disappear in about one hour. The pathological picture is undoubtedly one of typical acute inflammation. The nuclear fragmentation is as remarkable as that produced by diphtheria toxin.

The only explanation that appears to be feasible is that some toxin is circulating in the blood and when a wheal is produced some of the toxin is set free, producing necrosis followed by acute oedematous inflammation of the whole corium, accompanied by marked nuclear fragmentation.

November 4, 1907.

Dr. Finney presiding.

I. Exhibition of Cases. Dr. Thayer.

Dr. Thayer reported the clinical history of a case of acute yellow atrophy of the liver. The patient was a colored woman, 30 years of age, admitted to the hospital on October 7, 1907 in a state of coma. For a month previous she had been complaining of pain in the extremities, weakness, and a constant pain in the epigastrium. During this period she had had occasional vomiting, especially after meals, while her appetite remained normal and she apparently slept well. During the last two weeks previous to her admission to the hospital, the symptoms increased in severity and the patient spent much of her time in bed. Five days before admission to the hospital, the patient came to the dispensary for treatment, when it was noted that the liver extended two fingers' breadths below the costal margin in the right mammary line. On October 5, the patient became unconscious at her home. She exhibited great restlessness, tossing her head about continually. On admission to the hospital it was noted that the patient was in deep coma, the pulse 19 to the quarter minute, the sclerae moderately jaundiced, the respirations quiet as though the patient were asleep, and the patient making chewing movements with the jaw. There was lateral nystagmus. Her restlessness increased and she developed marked air hunger. She remained unconscious with repeated convulsive movements and died on October 10. On October 7, Dr. Thayer made the note that the liver was not enlarged; on October 9, that the area of dulness of the liver was very small, especially that of the left lobe. There was no liver dulness to the left of the midline at the time this observation was made. Besides the extreme rarity of the condition the point of interest was that during the last week of life a definite progressive diminution of liver dulness was noted at several successive examinations.

This is the third case of acute yellow atrophy in the history of the Johns Hopkins Hospital. The clinical diagnosis was based on the coma associated with convulsions and the progressive reduction in the size of the liver dulness.

Morgagni was perhaps the first to report a case of this disease. His report was based on an observation of Valsalva. In 1843 Rokitansky gave the first pathological account. Richard Bright in 1836 described several cases as typifying a condition of inflammation of the liver.

Dr. MacCallum reported the pathological findings in this case. The anatomical diagnosis substantiated the clinical diagnosis, that of acute yellow atrophy. The liver was only one half normal size, weighing 840 gms. Atrophy of the organ was particularly marked in the left lobe, which was reduced to a thin, elastic, film-like structure.

Dr. Voegtlin took up the chemical aspect of the case. The urine, voided by the patient during the day previous to death, was examined. In accordance with the results obtained by other investigators it was found that the ammonia ratio was very much increased above normal. This together with a high organic acidity and the typical air hunger pointed toward an acid intoxication. The presence of tyrosin and leucin could not be demonstrated. The substances therefore have not the diagnostic importance that some authors ascribe to them. For diagnosis the high ammonia ratio (15 to 25 per cent) may turn out to be of some value, as it has been so proved by Dr. Williams in cases of toxaemia of pregnancy and pernicious vomiting. With pregnancy ruled out, the high ammonia ratio associated with jaundice would in a given case be highly suggestive of acute yellow atrophy of the liver. The faeces were too small in amount for analysis. The amount of liver that was analyzed weighed 770 grammes. It contained 78 per cent of water, 6.6 per cent of fat and only traces of glycogen.

The fat content of the liver was thus found to be only slightly increased (about 3 per cent is normal) whereas in this disease the liver usually contains a high excess of fat. The small amount of glycogen found supports Rosenfeld's theory that fat from other parts of the body is deposited in the place of glycogen where liver necrosis exists. The activity of the ferments was tested and some interesting results were obtained which will be worked out more extensively in the near future.

II. Exhibition of Pathological Cases. Dr. MacCallum.

Dr. MacCallum reported the case of a white man, aged 50, whose autopsy revealed the cause of death to be rupture of the wall of the heart and consequent haemo-pericardium. The patient had a clinical history of having experienced attacks of syncope eighteen months before death. He was perfectly well subsequently until forty-five hours before death, when after violent exertion he suffered pain in the region of the heart. The pain persisted together with attacks of bradycardia between which the pulse rhythm would be normal. At times the pulse was as low as 29 to the minute; there were no extra systoles, and no enlargement of the heart on percussion. Several epileptiform convulsions supervened before death. At autopsy the pericardium was found to be filled with blood which was partly clotted: in places the clot was fully 1 cm. thick. There was a ragged hole in the anterior wall of the left ventricle, about 1 cm. to the left of the vein that corresponds to the interventricular septum. Some blood clot was adherent to and extended into this ragged opening. The interventricular septum throughout its entire extent was opaque, of a grayish ochre color and was evidently necrotic. This appearance extended to within 1 cm. of the pulmonary orifice where it was sharply marked off from adjacent normal heart wall. The wall of the left ventricle was greatly hypertrophied, but its tissue was not abnormal.

The trabeculae were opaque and frequently broken through. In the angle between the wall of the ventricle and the septum was a hole, through which a probe was passed until it extended through the opening on the anterior surface of the heart. Both coronary arteries were markedly sclerotic. The anterior descending branch of the left coronary artery was completely occluded by a thrombus, 3.5 cm. from its orifice. The

sequence of events has evidently been: coronary sclerosis, thrombosis of the left descending branch, infaretion of the interventricular septum, rupture of the heart wall, haemopericardium.

III. A Theory of Vagus Inhibition. DR. HOWELL and MR. DUKE.

The authors reported a series of experiments, made chiefly upon the isolated heart of a dog, in which it was shown that inhibition of the heart through the vagus nerve is accompanied by an output of potassium from the substance of the heart.

The method used in these experiments was as follows: The isolated heart was kept beating by a supply of warm Locke's solution, fed into the coronary arteries under oxygen pressure. The inflow canula was placed in the brachiocephalic artery; and the other branches of the aorta and the aorta itself, at the level of the first intercostals, were tied off, thus directing the flow into the coronaries. The venous outflow from the heart was caught through a canula, inserted into the superior vena cava and penetrating into the right ventricle. Two supplies of the Locke's liquid were used. One, a large stock supply of about 8 litres, was used in first isolating the heart and in maintaining the circulation in the intervals between stimulations of the vagus. The other supply consisted of about 75 cc. of the liquid and this was run through the coronary arteries after each inhibition of the heart. Usually the heart was inhibited seven or eight times so that the special supply at the end had been irrigated through the heart seven or eight times. Specimens of this solution were taken for analysis and the results were compared with those obtained from the stock solution which had been circulated through the heart only once. Control experiments were made in which a small supply of the liquid was irrigated through the heart eight or more times without stimulation of the vagus, or with stimulation of the accelerator nerves.

The results of these experiments have shown conclusively that inhibition of the heart through the vagus causes a change in the heart substance such that a soluble potassium compound is liberated and is given off to the circulating liquid. The analyses showed that the potassium contents of the circulating liquid might be increased as much as 29 per cent, and it was estimated that each stimulation of the vagus liberated 0.4 to 0.5 mgrm. of potassium. The authors interpret their results to mean that the inhibitory impulses through the vagus cause a dissociation of an indiffusible potassium compound in the heart with the liberation of potassium in diffusible form. Assuming that this liberation takes place in the auricles or in a part of the auricles, enough potassium may be set free by the vagus to give potassium inhibition. In connection with other similarities known to exist between the conditions of vagus inhibition and potassium inhibition their experiments were offered as direct evidence for the theory that vagus inhibition is a case of potassium arrest.

NOTES ON NEW BOOKS.

The Prevention of Infectious Diseases, being The Lane Lectures delivered at Cooper Medical College, San Francisco, in August, 1906, and revised for publication. By JOHN C. M'VAIL, M. D., D. P. H., etc. Price, $2.75. (*New York and London: Macmillan & Co., Limited, 1907.*)

This volume is the modified and extended form in which the Lane Lectures delivered at Cooper Medical College, in San Francisco, during August, 1906 have been presented to the public. They are of great value as another record of the fruits of an endowed lectureship, the number of which is increasing slowly in this country, and as the opinion of one of the best public health officers of Scotland, concerning modern methods of combatting infectious diseases, and the definite lessening of the mortality from such diseases as a result of improved sanitary measures. The author is the county medical officer for two important medical districts in Scotland, and speaks from a rich storehouse of personal experience. There are in all ten lectures, the first being devoted to public health organization in Great Britain, the others to the prophylaxis of certain diseases, two lectures, however, being given up to typhoid or as M'Vail more frequently speaks of it, enteric fever. The lecture on typhus fever is extremely interesting historically, and is the only chapter which fails to have a direct bearing upon preventive medicine in America, since of all the diseases treated in detail, typhus fever is the only one not represented in this country. In typhus the author brings out with great clearness the practical disappearance of the disease as a result of cleaning up some of the evil, foul districts in the cities of Scotland, and makes the interesting suggestion that fleas may have been the carriers of the unknown virus. No special attention is paid to cholera, which is as little feared in Great Britain as in America, and probably for the same reason, there is no detailed consideration of the methods of prevention of malaria and yellow fever. The diseases—plague, measles, scarlet fever, diphtheria, smallpox, and tuberculosis—are treated in great detail, and in a very interesting manner. The book is well illustrated and contains a number of valuable charts, showing especially the diminishing mortality from tuberculosis and typhoid fever in England and Scotland. In dealing with plague, the author is keenly alive to the great advances which have been made in the etiology of this disease, and he has succinctly presented the evidence now at hand as to the rôle which the flea plays in its spread. In discussing the reasons why plague in earlier times raged so fiercely in Great Britain, and yet failed to get a permanent foothold there at the time of the last visitation in Glasgow, the author points out that the black rats formerly common in England and Scotland, *mus rattus*, with its Pulex cheopis which bites man, have been supplanted by the brown rats, *mus decumanus*, with its Ceratophyllus fasciatus, which does not bite man. The particular flea, therefore, which carries plague from rats to man is absent from England now, and even if the rats should become infected, London need not fear a repetition of the great plague of 1665.

In the chapter on *Smallpox* the influence of vaccination upon the incidence of the disease is well brought out by the fact that smallpox is at the present time a disease which may attack persons of all ages, spasmodically, whenever an unprotected population grows up, while before the Jennerian era, it was the prevailing disease of *childhood*, which no one could hope to

escape absolutely, and from which a very considerable proportion of children would surely die.

Unfavorable criticism of the book can be offered in only one respect. In the treatment of the prevention of typhoid fever little or no attention is paid to the subject of *chronic bacillus carriers*, the recognition of which is the only adequate explanation of the origin of many small epidemics and isolated cases.

Despite this fact the subject of typhoid fever is handled in a thoroughly valuable manner, and the volume can be most highly recommended to the medical public.

A Clinical Atlas. Variation of the Bones of the Hands and Feet. By THOMAS DWIGHT, M. D., LL. D., etc. Price, $5.00. (*Philadelphia and London: J. B. Lippincott Company.*)

Both to anatomists, who are especially interested in osteology, and to surgeons, this atlas will be not alone of interest, but of real help. Dr. Dwight is a recognized authority in osteology, and in this book gives to the profession a work which it has long needed, and which did not exist in English. There are several classical works on the same subject in German, but these are unknown to the majority of men by whom this new volume will be welcomed. The illustrations are excellent, and the accompanying text is brief but clear and sufficient. All that is to be regretted is that the price of the book will prevent its reaching as many doctors as it should. To those who have to study X-ray photographs of the hands and feet this atlas will be invaluable. R. N.

Functional Nervous Disorders in Childhood. By LEONARD G. GUTHRIE, M. A., M. D., F. R. C. P. Oxford Medical Publications. Price, $3.00 (*London: Henry Frowde, and Hodder & Stoughton, 1907.*)

This is an admirable book upon a too little considered subject of actual importance to the health of children and its appearance in the present age of over-stimulation and educational strain is most timely. It would be well for the future of many nervous children if this work could be placed in the hands of teachers and family physicians so that parents might be properly instructed. The author wisely believes that nervous instability in children is an individual instability rather than a general one common to all children, or in other words that childhood is not necessarily a period of peculiar stress except among neurotic children. He believes that nervous instability may manifest itself in a variety of modes, as for example in a lack of co-ordination between the higher and the lower centres or defective control of the lower by the higher centres or an abnormal explosiveness, an exuberant energy as it may be called of the nervous system or an explosiveness combined with fatigue exhaustion or finally neurasthenia with irritability and exhaustibility of all parts of the cerebro-spinal system. He further believes that in neurasthenia in childhood there exists an abnormal capacity for feeling emotions and points out very lucidly that the individual neurasthenic may be of the unrestrained emotional type, or on the other hand, of the restrained emotional type, and yet that both of these types may have an equally abnormal emotional susceptibility. All will concur in his statement that most functional neuroses are of physical origin, and in the conclusion that neurotic children require to be kept as free as possible from psychical influences of a disturbing character. The chapters on the hyper-sensitiveness of neurotic children and especially the sections "Appetite and Dislike," "Fears of Neurotic Children," and "Fretting and Homesickness" are very suggestive. In speaking of the disorders of sleep he makes the very sensible remark that early wakers should be early risers. Children who are sent to bed at 5 p. m. can hardly be expected to respect the quiet of people who desire a 9 a. m. breakfast, and surely ought not to be condemned to spend several waking hours in bed. The author's remarks about the use of tobacco, cigarettes, alcoholics, and tea and coffee are very wise. These stimulants and narcotics are not needed by children, and they are better without them, but it is not wise to go to the extreme employed by many in their denunciation.

His observations on mental and educational overstrain are extremely sensible. The average boy with little desire for study and great capacity for sports is not in any danger of over-study and consequent overstrain. It is only the neurotic and abnormally constituted child who is susceptible to such over-stimulation, and he should be guarded against it by parents, teachers, and physicians. He points out that many of the evidences of overstrain, such as headaches and digestive disorders, disappear upon a correction of anomalies of refraction and regrets that all do not so disappear. The latter part of the book deals with such interesting disorders as primary dentition, spasmodic affections (convulsions), spasmodic asthma, chorea, and the various tics. All of these chapters are good, but the latter is especially so. The book opens up new fields of thought to all who have anything to do with the health, training, and education of children.

Surgery: Its Principles and Practice. In five volumes. By 66 eminent surgeons. Edited by W. W. KEEN, M. D., LL. D., HON. F. C. S., ENG. and EDIN., Professor of the Principles of Surgery and of Clinical Surgery, Jefferson Medical College, Philadelphia. Volume II. Octavo of 920 pages, with 572 text-illustrations and 9 colored plates. Cloth, $7.00. (*Philadelphia and London: W. B. Saunders Company, 1907.*)

It is probable that the name of the editor of a system of surgery or medicine, does more to secure its acceptance by the profession at large than anything else concerning the work. It would be interesting to know how far such an editor holds himself in any way sponsor for views expressed by his contributors. This seems to the reviewer of special moment in a surgery, where a brilliant surgeon as contributor may advocate an operation which the editor from his wide experience knows to be less good than some other. The reviewer does not mean to imply that he has noted any such possible conflict of views in this system, but it would seem to be a danger that would be more likely to occur in a system of surgery than one of medicine. In all systems there is unevenness in the quality of the articles—many of those best fitted to write are unable to do so for one reason or another, so that in any system some articles will be far superior to others. On this account the productions of individual authors have their distinct advantages, and are far more easily reviewed. Dr. Keen has secured the assistance of able men, and his system will undoubtedly rank as one of the best of those on surgery of to-day. That the call for this work can be large seems doubtful—it is too costly, and the surgeon of large practice must needs have monographs. To those who like systems and desire to buy one, this one can be warmly recommended—it has many illustrations of a good quality to add to its value. R. N.

A Manual of Clinical Diagnosis. By CHARLES E. SIMON, B. A., M. D. Sixth edition, thoroughly revised. (*Philadelphia and New York: Lea Brothers & Co., 1907.*)

The author has revised this book so that now it contains the recent new material without any increase in its size. It is in every way up to date. The question which arises is, should a book of this size be so comprehensive? It deals with the chemistry and microscopy of all the body fluids, secretions, transudates, and exudates, and even milk analysis, and also purports to cover all of clinical bacteriology and parasitology. Is such a book safe in the hands of a medical student? Should not these subjects be covered by at least two volumes, or perhaps by three, each of the size of this one? While we wish to bear witness

to the value of Dr. Simon's book, the pioneer in this field, we would emphasize that the worker who depends on text books of this nature cannot be quite "safe," for descriptions of chemical methods admit of scarcely any condensation, and it is just as important to know what the object under the microscope isn't, as what it may be.

Modern Surgery: General and Operative. By J. CHALMERS DACOSTA, M. D., Professor of the Principles of Surgery and of Clinical Surgery in the Jefferson Medical College, Philadelphia. Fifth revised edition, enlarged and reset. Octavo volume of 1283 pages, with 872 illustrations, some in colors. Cloth, $5.50. (*Philadelphia and London: W. B. Saunders Company, 1907.*)

The five editions of this work prove that it has been a welcome addition to the over-burdened shelves of the surgeon, and this is perhaps the best compliment that could be paid to Dr. DaCosta. One undoubted reason that this surgery has proved a success, beyond its original intrinsic merit, is that it has really been kept up to date. In the present fifth edition much new and important matter has been added, in the descriptions of operations which were known but to a few when the fourth edition was published. Many of the old sections have been "altered, corrected, or expanded," so that the young surgeon can here find in a well printed and illustrated volume not only the personal views of an able surgeon, but the necessary information to guide him safely in his practice. For a longer review of this work, the reader is referred to the criticism which appeared in this journal, in April, 1904. R. N.

The Treatment of Disease: A Manual of Practical Medicine. By REYNOLD WEBB WILCOX, M. A., M. D., LL. D., Professor of Medicine at the New York Post-Graduate Medical School and Hospital. (*Philadelphia: P. Blackiston's Son & Co., 1907.*)

This volume of almost nine hundred pages is devoted to the treatment of disease. There is a discussion of the etiology, pathology, course, symptoms, unusual features, complications, and prophylaxis as well as of the treatment of each disease. These sections are clearly of greater length than a mere treatise on treatment would need, and hence a more correct title of the book would be, "A Text Book of Medicine." The author speaks of "the bacillus typhosus," "the micrococcus lanceolatus," etc., and anglicizes many chemical terms.

The paragraphs on "Treatment" are of course the most interesting. The author deals with the medicinal treatment in a very thorough manner. Possibly he suggests in the lists of drugs many which now would better be omitted. At least one might get the idea from these sections that each symptom had its dose. Such a catalogue of drugs may be valuable for practitioners, but hardly safe for students. Our chief criticism is that the author emphasizes medicinal treatment, and devotes too little attention to mechanotherapy, psychotherapy, etc., wherein lie the chief recent advances of our art.

Modern Medicine: Its Theory and Practice. In original contributions by American and foreign authors. Edited by WILLIAM OSLER, M. D., Regius Professor of Medicine in Oxford University, England; formerly Professor of Medicine in Johns Hopkins University, Baltimore; in the University of Pennsylvania, Philadelphia, and in McGill University, Montreal. Assisted by THOMAS MCCREA, M. D., Associate Professor of Medicine and Clinical Therapeutics in Johns Hopkins University, Baltimore. In seven octavo volumes of about 900 pages each, illustrated. Volume III. Price, per volume, cloth, $6.00, net. (*Philadelphia and New York: Lea Brothers & Co., 1907.*)

As three volumes of this new system of "Modern Medicine" have now appeared, it is fair to compare it with other similar systems, and to express a definite statement as to its value. This is all the more welcome a task as the reviewer feels that the work is an excellent one, and in many ways a most valuable contribution to medical literature. There are few works of this nature in which flaws may not be picked, individual articles may be criticized, or the general arrangement, or the distribution of the papers to different authors, but it is not by such questionings that the work must be valued, but only as an entity, and as such this system takes rank with the last English system, edited by Dr. Allbutt, which received very high commendation from those best able to judge of its merits. And as in that system many articles are referred to constantly as the best on the subject dealt with, so in the future, it is certain articles in Osler's system will be referred to in the same way.

A third of the present volume is taken up by "Tuberculosis," dealt with from nearly every point of view. This is not too much space to devote to the most important disease which to-day afflicts mankind. Weight must be laid upon the necessity of teaching doctors to recognize the disease in its early stages, and a thorough knowledge of it in all its bearings on morbidity and mortality. It is therefore right that this subject should have been so broadly handled, and it is to be hoped that many will read it from beginning to end. There is some danger that all the talk about this disease will make the public tired, but that danger must be run, and is not to be considered for a moment in comparison with the immense benefits that are to be won by a thorough understanding on the part of the public of the necessity of controlling this disease. One chapter of this article is most especially to be commended—the "Pathology of Tuberculosis" by Dr. W. G. MacCallum. Pathology is to many a dry subject, but few who read this paper can fail to be interested, and even enthusiastic. The author has the rare capacity among medical men of drawing a real picture of the morbid appearances he is describing in such a manner as to make the details clear to a man of average intelligence, and at the same time he is able to present all the important features. If the word "charm" may be applied to such a treatment, his method is "charming."

It was a favorite dictum of Osler's that if a physician knew "syphilis" he knew all medicine. By this he meant that syphilis assumed such a protean shape, that if all its forms were recognized, the doctor who could do this must be able to differentiate them from a multitude of other diseases. As syphilis, next to tuberculosis, is probably the disease of most significance to the human race, it is well that a hundred pages have been devoted to it, but it is doubtful whether clear as this article is, it is sufficiently expanded to enable a doctor to know all medicine.

It is interesting to find in this system an article on "Gonococcus Infections," a subject which has usually been left to surgeries for discussion. But with the modern treatment of vaccines, it is right that these infections should find a place in a large work on medicine.

The "Infectious Diseases" begun in Vol. II are concluded, and "Diseases of the Respiratory Tract" follow, and complete Vol. III. Some of the contributors are young men, as yet unknown to the profession at large, but men who have had large hospital experience, and are sure to become famous as years go on; and their papers here are proof of their ability. The competence of the other authors is so well established as to need no further comment.

The editing of "Modern Medicine" is almost faultless—a few of the black and white illustrations might have been omitted, but it is hardly worth while to notice such a small point, when there are none larger to point to. R. N.

A Memoir of Dr. James Jackson. By JAMES JACKSON PUTNAM, M. D. (*Boston and New York: Houghton, Mifflin and Company.*)

In this memoir Dr. Putnam has set an example which we cannot help regretting is not more often followed. He has given

us an account of the life of one of the most notable characters in early American medicine, and in addition to this an illuminating description of many of the interesting occurrences in New England, and also much of importance in the history of American medicine, its development and improvement, both as regards practice and education.

The first part of the book deals with the history of the Jackson family, one which took a prominent part in the early history of the country. Dr. James Jackson belonged to a large family, whose history is naturally of more general than of medical interest. The greater part of the volume, however, deals with the subject of the memoir. It is no easy task to bring before us the characteristics of a man, but it seems to us that Dr. Putnam has succeeded to a great degree. This is true not only of his own descriptions but also of the well chosen quotations from other writers, not the least interesting of which are those from Oliver Wendell Holmes. Dr. Jackson's early life offers no points of any special interest. He began the study of medicine with Dr. Holyoke, of Salem, in 1797, and afterwards he was able to spend some time studying in London, where he worked at St. Thomas Hospital, and with Astley Cooper at Guy's. Perhaps the leading teacher at Guy's in those days was William Saunders, who had considerable influence in the developing of medical teaching. In addition Dr. Jackson took a special course of instruction in vaccination, which was to bear fruit later on. He took the degree of Bachelor of Medicine in 1802, and of Doctor of Medicine in 1809. His thesis for the latter was on the Brunonian System.

He returned to Boston in 1800 and began to practice. He at once introduced the question of vaccination, and took an active part in support of it. At this time Dr. Waterhouse was carrying on an active campaign for the use of vaccination. Dr. Putnam gives an interesting chapter on the Harvard Medical School, where in 1810, after a reorganization, lectures were begun, Dr. Jackson giving those on Clinical Medicine. The formation of medical societies and the publication of medical journals were both important events at this time in which Dr. Jackson was interested. In 1812 he was appointed Hersey Professor of Physic in Harvard College, in succession to Dr. Waterhouse. Soon after this came the foundation of the Massachusetts General Hospital, Dr. Jackson being appointed an acting physician. Of the importance of this and its influence on medicine, it is not necessary to speak.

A melancholy interest attaches to the chapter which gives an account of the life of James Jackson, Jr. A number of letters from the father to the son are given, written while the latter was in Europe.

Dr. Jackson's written contributions were fairly numerous, perhaps his "Letters to a Young Physician" are those which are best known or should be, and which no medical student should be without. His essays are also of great interest, especially the one on "Conduct in the Sick Room."

Altogether we must congratulate and thank Dr. Putnam for this memoir of James Jackson, which has preserved for us the personality of a notable figure.

Trypanosomes and Trypanosomiases. By H. Laveran and F. Mesoril; translated and enlarged by D. Nabarro, M. D., etc. (*Chicago: W. T. Keener & Co., 1907.*)

This large book on the trypanosoma diseases is one which must be invaluable to the worker in regions where those diseases exist for it brings together in concise and very readable form practically all the knowledge which we possess at present as to the part played by these curious protozoa in disease. The book begins with a general review of the history and of the geographical distribution of these diseases, and after a chapter on the technical methods for their study there is a discussion of the general biology and morphology of the parasites. This is followed by chapters on parasites in various animals which are not associated with especially important diseases, and then there are taken up those conditions, Nagana, Surra, Mal de Caderos, Dourine, etc., which have caused such havoc among domestic animals in warm countries. In each case the symptoms, pathological anatomy, character of the parasite, and mode of transmission are described and the prophylactic and curative measures discussed. These latter it is true are as yet most incompletely worked out, but recent results with atonyl which are only hinted at in this book seem more promising. Of especial interest it seems is the curative effect of human blood serum in such diseases as nagana and surra, from which man is naturally immune. The mechanism of this action might be studied more closely by the methods so widely used at present.

Especially full is the discussion of sleeping sickness and its transmission by the bite of one of the Glossina flies, which introduces the trypanosoma gambiense. Great credit is due to the British and other observers who have worked out the relations of the trypanosomes to this disease in the last few years.

After this are chapters on the trypanosomes of birds, reptiles, batrachians, fishes, etc., and of the Tsetse flies themselves. The volume is concluded with statistical tables and maps showing the distribution of the various diseases. On the whole the book is for its purpose admirable and cannot be too highly praised. It is a volume which contains in the most practical form the immense mass of detail which is the result of the abundant studies of the protozoan diseases of this type in recent years, and it is significant of the rapidity with which knowledge on this subject has advanced that the oldest references are to work done subsequent to 1880.

Oxford Medical Publications: 1. *Diseases of the Male Generative Organs.* By Edred M. Corner, M. A., M. B., etc. Surgeon to Outpatients, St. Thomas Hospital. Price, $1.50. 2. *A Manual of Veneral Diseases.* By Officers of the Royal Army Medical Corps: Sir Alfred Keogh, K. C. B., Lieut.-Col. C. H. Melville, R. A. M. C., Col. Leishman, R. A. M. C., and Major C. E. Pollock, R. A. M. C. Price, $1.50. (*London: Henry Frowde, and Hodder & Stoughton; New York: Oxford University Press.*)

These two manuals more or less supplement each other, as in the first there is very slight consideration of syphilis and gonorrhœa, to which diseases the other volume is entirely devoted. Dr. Corner, in his introduction, says, "an attempt has been made in this manual to present a practical survey of the diseases of the generative tract, uncomplicated by consideration of those of the urinary tract." For this reason he omits discussion of syphilis and gonorrhœa, and also of the diseases of the prostate. The manual prepared by officers of the Royal Army Medical Corps is based on reports, submitted by a committee of the Army Medical Advisory Board, appointed to consider the question of the treatment of Venereal Diseases in the Army. This latter manual will appeal especially to army doctors, and is well adapted to that end. The discussion of syphilis and gonorrhœa is good, though brief as it must be in a manual, and the appendices of tables of treatment, registers of patients, and statistics will prove helpful to members of the R. A. M. C. Dr. Corner's book will also be of service to many who are not specialists in the diseases of the male generative organs, but who desire to have a useful working knowledge of these troubles. First-class manuals are as rare as first-class productions in other lines of work, but these two are above the average, and do credit to their authors. R. N.

Treatment of the Diseases of Children. By Charles Gilmore Kerley, Professor of Diseases of Children, New York Polyclinic Medical School and Hospital; Attending Physician to the New York Infant Asylum, etc. (*Philadelphia and London: W. B. Saunders Company, 1907.*)

The author has succeeded in presenting in a clear manner a

volume of good practical directions for the management of children's diseases.

There is nothing especially new to be found in the book, but the best modern methods are presented in a conservative commonsense way.

The chapter on "Nutrition and Growth" certainly the most important in any work on Pediatrics has been given the prominence it deserves. Nothing which is of use in infant feeding has been discarded but the entire subject is discussed in a very fair and satisfactory manner from the practical point of view.

The same detail characterises the book throughout.

There is a chapter on gymnastic therapeutics which will be found useful and also a table of drugs helpful in the practice among children and their dosage.

The arrangement of subjects seems somewhat peculiar, contagious and infectious diseases being in entirely different parts of the book, and cyclic vomiting is placed with infectious diseases.

In conclusion it can be safely said that this book will be of undoubted usefulness to those engaged in the general practice of medicine where so often practical suggestions in detail are found very helpful in the management of the disease of children.

Atlas and Epitome of Diseases of Children. By DR. R. HECKER and DR. J. TRUMPP, of the University of Munich. Edited by ISAAC A. ABTE, M. D., Assistant Professor of the Diseases of Children in Rush Medical College. (*Philadelphia and London: W. B. Saunders Company, 1907.*)

The great attention given to the study of diseases of children in the past few years has made it impossible to condense into a volume of this size a comprehensive knowledge of the subject. This does not appear to have been the intention of the authors, but rather to present to students a volume full of illustrations with sufficient text to make them clear.

In this they have succeeded unusually well and the work is notable for the number and excellence of colored plates and black and white illustrations.

In some instances the authors' ideas, particularly as to treatment, differ somewhat from the accepted methods in this country, but these have been largely made to conform by the editor.

The entire field of pediatrics has been covered and while the descriptions are necessarily too brief for purposes of reference, they are unusually concise for a work of the kind, and with the excellent plates it will be found of real value to both students and general practitioners.

Manual of Anatomy. Systematic and Practical, including Embryology. By A. M. BUCHANNAN. Vol. II, 8vo, pp. 575-1539, with 363 illustrations. Price, $2.75. (*Chicago: W. T. Keener & Co., 1907.*)

As the title implies and as further emphasized in the author's preface in the first volume, this volume and its companion are meant to be more than a manual of anatomy. These volumes then must be regarded as a combination of a text book and a manual. It is obvious that this fact implies certain limitations upon the descriptive text. Consequently the body of this volume is composed of a bare enumeration of the essential facts of the anatomy of the abdomen, the throat, the head and neck, the nervous system and the eye and ear. The description of a region is begun with a short discussion of the landmarks and the fasciae. Then follows an enumeration of the muscles, their origin, insertions, nerve-supply and actions being given in the order named. The anatomical variations receive but slight attention, but occasionally supplementary matter is introduced in a paragraph in smaller type.

The numerous illustrations, 254 of which are original, add greatly to the value of the book, and are generally of sufficient artistic merit to be acceptable in a manual, perhaps. Those copied are taken from Hirschfeld and Leveillé, Testut, Tiedemann, Henle, Gray, Sappey, Spalteholz, Poirier and Charpy, and other well-known sources. These are well-chosen and surpass most of the original ones in accuracy and execution. Those on the sympathetic system are very diagramatic. There are but four on the lymphatics and two of these are identical. The description of both these systems is inadequate and none of the recent work on the lymphatics finds recognition.

The abbreviated developmental notes are to the point, and usually of value as aids in explaining variations or rudimentary structures which the student may find. Occasionally, however, it is doubtful whether sufficient information is contained in them. As an example we quote from page 1038:

"*Development.*—The internal jugular vein is usually regarded as being of later development than the external jugular and it joins the primitive jugular vein near its lower extremity. According to some authors it is developed from the primitive jugular." A similar note is found on page 1009.

The directions for the dissector are given in three places in the volume. Those for the abdomen—including the perineum and pelvis—are found on pages 849-869; those for the thorax on pages 974-982; those for the head and neck, the nervous system and the eye and ear on pages 1433-1466, at the end of the volume. For dissecting room use the type is too small and the pages are too crowded to enable the student to follow the directions with ease. The directions are clearly stated, however, and are usually given so as to permit the completion of the dissection of one structure, organ or region. An exception to this is found on page 853, where the first directions for the dissection of the penis are begun. These are not completed until page 868. Likewise directions for the dissection of the testis and scrotum are begun on page 853; those for the spermatic cord an page 856; while those for the testis are completed on page 858.

Attention may be called to the following:

The legend with Fig. 370 does not state at what level the cross-section was taken; there is a whole line of typographical errors on page 1071; to the ambiguous expressions—"The cord or cords in front of the vessel form a loop around it"—page 1157, and "behind the internal ring" on pages 635 and 858; to the badly proportioned illustrations on pages 1059 and 1108.

There is an appendix in this volume which contains those "English and Latin" (B. N. A.) terms which differ from each-other in large type in parallel columns, and a glossary and an index which answers all purposes. Both the table of terminology and the glossary are valuable additions to the book.

The binding in English linen buchram is durable and especially well-suited for laboratory use. The type is good and differential, the text clear, typographical errors few and this volume, like the first, of convenient laboratory size.

It would not be just to close this review without some reference to the historical atmosphere which pervades these volumes. This is manifested largely in the non-parenthetical designation of anatomical structures by names. To wit: Meckel's cave; Abernethy's fascia; membrane of Bruch; pauches of Troltsch; ducts of Walter, etc., etc. It is further shown in the use of such terms as glandulae concatanatae; in the entire absence of either direct or indirect evidences of the embodiment of recent important contributions, and in the repeated assertions that the serous cavities communicate with the lymph canalicular system by means of stomata and the actual representation of these stomata.

A. W. M.

Papers Upon Genito-Urinary Surgery. By A. T. CABOT, A. M., M. D. (*Boston: David Clapp & Son, 1907.*)

In this small pamphlet Dr. Cabot has collected seven papers on the kidney and prostrate. The articles are brief, but the

points which he wishes to emphasize are brought out clearly. His reputation in this special branch of surgery is so well established, that these papers will be welcome to all those working along the same line. R. N.

Progressive Medicine. Edited by HOBART HARE, M. D., etc., assisted by H. R. M. LANDIS, M. D., etc. Vol. IV, December, 1907. (*Philadelphia and New York: Lea Brothers & Co., 1907.*)

This volume contains reviews of the latest work on "diseases of the digestive tract and allied organs, the liver and pancreas," by Dr. J. Dutton Steete; on "diseases of the kidneys," by Dr. John Rose Bradford; on "surgery of the extremities, fractures, dislocations, tumors, surgery of joints, shock, anaesthesia and infections," by Dr. Joseph C. Bloodgood; on "genito-urinary diseases" by Dr. William T. Belfield; with a "practical therapeutic referendum," by Dr. H. R. M. Landis; and an index. The task of revising the most important articles on these diseases which have lately appeared is well done by the various contributors and the volume is a useful one to any practitioner desirous of getting a survey of recent ideas and work done along certain lines. Most doctors have not the means at hand to get this information for themselves, and many have not the knowledge of foreign languages necessary to read the original articles, so that this series of volumes of "Progressive Medicine" is one of real value and importance to a large percentage of the medical profession. R. N.

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CONTENTS.

	PAGE
Albrecht von Haller: Scientific, Literary, and Poetical Activity. By John C. Hemmeter, M. D., Ph. D.	65
Primary Hemangiomata of Muscle. By John Staige Davis, M. D.	74
Pulmonary Complications following Anæsthesia. By Otis B. Wight, M. D.	89
On the Relation of the Parathyroid to Calcium Metabolism and the Nature of Tetany. By W. G. MacCallum, M. D., and C. Voegtlin, Ph. D.	91
Proceedings of Societies.	PAGE
The Johns Hopkins Medical Society.	92
Exhibition of Cases [Dr. Cushing];—Exhibition of Cases [Dr. Williams];—Effect of Changes of Blood Pressure upon the Pulse Rate [Dr. Eyster and Dr. Hooker];—On the Excretion of Urotropin in the Bile and Pancreatic Juice [Mr. Crowe];—A Family of Hemeralopes [Dr. Bordley];—Exhibition of Cases [Dr. Randolph];—The Practical Value of the Demonstration of Spirochæta Pallida in the Early Diagnosis of Syphilis [Dr. Geraghty];—Exhibition of Cases [Dr. Barker];—Pancreatic Disease [Dr. Emerson].	
Notes on New Books.	96
Books Received.	100

ALBRECHT VON HALLER: SCIENTIFIC, LITERARY, AND POETICAL ACTIVITY.

By John C. Hemmeter, M. D., Ph. D.

Albrecht von Haller was born October 18, 1708, at Bern, Switzerland. He was the fourth and youngest son of the attorney-at-law, Nicholas Emanuel von Haller. According to his own biography and the statements of his most reliable biographers, Ludwig Hirtzel and Jacob Baechtold,[1] he was possessed of extraordinary and precocious powers of observation; versatility in language, poetic talent, and unusual industry in collecting facts and objects. He is said to have been a very weakly, timid, and always serious child, and was taught by an old pedantic theologian, whose curious character aroused the satiric, poetic power of his tantalized pupil.

Haller himself narrates to his oldest biographer that at the age of nine years, he had produced an extensive lexicon of all the Hebrew and Greek words of the Old and New Testament, a Chaldaic grammar, and between one and two thousand biographies of distinguished personages.

However incredible these statements may appear, Ludwig Hirtzel, who, according to my friend, Professor Henry Wood of the Germanic Department of the Johns Hopkins University, is an absolutely reliable biographer, gives an authentic poem of Haller's of the year 1721, which is an elegy on the death of Frisching. The poem was written then when Haller was 13 years old, and in its title the poet calls himself a "poet who is a lover of virtue and disciple of wisdom." Whilst this poem does not show the perfect rhythm and majestic sentiment of the poems of his later years, it is nevertheless an effort that must be considered genuinely poetic.

In 1722 he left his native city and became a student under the physician John Neuhaus in Biel, who was a worshipper of the doctrines of Cartesius (Descartes), which, however, repelled his brilliant pupil.

At that time Haller was 14 years old, and now we are told of his first morbid inclination. He was continuously sick, avoided playmates, locked himself up for months and consoled himself with poetry in various languages. He wrote a long epic poem on the Origin of the Swiss Union of States, several tragedies, and translated Ovid, Horace, and Virgil. As another evidence of a morbid inclination, the facts may be cited that he once saved this mass of verse and literary compilation from a burning house at great risk, but later on he burnt them up, part and parcel.

In 1723 he went to the University of Tübingen, but was not well impressed with the rushing student life there, nor made much progress in his special studies, and in April, 1725, he

[1] Geschichte d. Deutschen Literatur in d. Schweiz, p. 489.

went to Holland to study under the renowned Boerhaave at the University of Leyden. A month before his departure, as Haller himself writes, he composed the beautiful hymn "Morning Thoughts." This is an apotheosis on the Omnipotence of the Creator and is undoubtedly one of the most impressive poems in the German language. A few lines to illustrate this poem may be pardoned:

Der Mond verbirget sich, der Nebel grauer Schleier
Deckt Luft und Erde nicht mehr zu;
Der Sterne Glanz erblaszt, der Sonne reges Feuer
Stört alle Wesen aus der Ruh—
Durchs rote Morgentor der heitern Sternenbühne
Naht das verklärte Licht der Welt;
Die falben Wolken glühn von blitzendem Rubine
Und brennend Gold bedeckt das Feld.

And then our poet, addressing the Creator of Nature, continues:

Du hast der Berge Stoff aus Thon und Staub gedrehet
Der Schachten Ërz aus Sand geschmelzt;
Du hast das Firmament an seinen Ort erhöhet,
Der Wolken Kleid darum gewälzt.

At that time Boerhaave was in the fullness of his power. The maturity of his broad experience undoubtedly laid the foundation of all the future works of Haller, but here Haller met two other men of scientific greatness; the younger Albinus, Frederick Bernard Albinus, a skillful and sagacious anatomist, who in 1745 became Professor of Anatomy; and also Ruysch, who was his teacher at 90 years of age. He took his degree of Doctor of Medicine in 1727 at Leyden on the basis of a thesis in which he exposed the error of Professor Coschwitz of Halle, who had maintained that he had discovered a new salivary duct of the submaxillary and sublingual glands, which Haller proved to be a vein. Thereafter he traveled extensively in England, visited Belgium and Paris in 1728, and studied mathematics in Basel with Bernouilli. In 1730 he returned to Bern and there practiced medicine and continued his researches in anatomy and physiology, spending his leisure hours in noting down poetic inspirations and making botanical explorations. In 1736 his fame had spread to such an extent that George II of England, who was also Elector of Hanover and Braunschweig, offered him a chair of anatomy, botany, and medicine at the newly-founded University of Göttingen. Haller accepted, and labored in Göttingen for 17 years, carrying out his most important inquiries and compiling most of his literary work. He founded the anatomical museum and laboratory, the botanical school and garden, and the obstetrical department at Göttingen. He was one of the founders of the scientific association and editor of its commentaries. Later on, he refused several calls to other universities, noteworthy among which was one by Frederick the Great, to a chair at the University of Berlin.

He returned to Bern in 1753, prompted partly by illness and partly by ambition for official station in his Fatherland. In Switzerland he passed the last 24 years of his life, taking his share of municipal and state duties. He eventually was elected a member of the great National Council of Switzerland.

Towards the last years of his life, persistent severe pain led him to the continuous use of opium. He passed quietly away on December 12, 1777. In the last moments of his life he had his fingers on his own pulse and said to his friend, who was standing at his bedside, "The artery no longer beats."

Haller was married three times. His most extraordinary versatility as a poet, litterateur, political economist, botanist, physiologist, physician and surgeon, has been the wonder of his many biographers.

He applied his tremendous intellect to the solution of many questions throughout physiology, and in the preface of the sixth volume of his Elementa, he gives a list of what he claims as some of his own discoveries. There is no doubt whatever that he correctly recognized the mechanism of respiration, and his researches on the "formation of bone" and the "development of the embryo" are of the highest importance.

His Literary and Poetical Activity.

In the year 1728, Haller, in company with a friend, traveled through his native country, which up to that time had been to him an unknown territory. The real object of this trip was not so much to observe the works of man as to get into communion with Mother Nature. In accordance with this plan he made a collection of rare specimens of the Swiss flora, and in fact everything, whether of high or low degree, became the object of his undivided admiration. Never did the uplifting thought leave him that God indeed had made everything beautiful, and devoted to some purpose in nature's economy. The glacier and the gentian, the tumbling brook and the dew drop, one and all, united our enthusiastic teleologist to God's service in His boundless temple of Nature.

The impressions made upon him were put into poetic form in the following year in a poem entitled "Die Alpen" (The Alps). Haller compared with biting sarcasm the low morality of his native town, Bern, with that of the old Swiss type, and thus emphasized his sympathy with Muralt's staid reformatory tendencies, revealed in the latter's "Letters about Englishmen, Frenchmen, and about my Journeys." He advises sufferers from the low morality of large cities not to seek recovery by going to Paris, but by travel to Switzerland where liberty and sincere morality prevail. Haller, the sentimental precursor of Rousseau, calls the people of Switzerland happy because of their ignorance about those evils which are the usual concomitants of growing cities. In his poem, in which he gives evidence of all that manly strength of which he is capable, and in which moreover he displays intense longing for pastoral quietude, he described the inhabitants of the Alps, not as peaceful Arcadian shepherds of the well-known stage type but as children of Nature, honest, unsophisticated people of the good old time. He praises their high ideals of matrimony, their harmless, good-natured festivities, their brawn, their various occupations as called for by the changing seasons, and brings all these things to the notice of the dwellers in cities. He pictures to us a beautiful landscape, surrounded by the Alps, which serve as a natural defence

against the evil influence of the outer world. Winter approaches and you enter the hut high up in the mountains. Three generations gather around the fire-place—a young poet of nature sings his simple melodies, three older members follow him in turn, one speaking of the wonders of nature, and the others relating stories of heroism in the battles for independence, and praises:

Tell who removed with intrepid courage the yoke which is still borne by half of Europe.

Thus from the Swiss mountains resounds first the battle cry "In tyrannos," which Schiller, Haller's successor in many respects, so frequently used, Goethe having previously made use of a democratic motto from Haller for his "Goetz von Berlichingen." Liberty and decent moderation are the unflinching precepts in a poem which forms the sentimental and purposeful supplement to his "Vitiated Morals," and the satire "The Man after the World." The young citizen of Bern thus described his countrymen:

No, surely 'twas not so before France got to know us,
Unknown to us were then the very names of crime;
Harmful extravagance our poverty withheld.
Sin in its wake was foiled by gentle singleness.
We had one fatherland, one God, and one free heart;
But now, alas — we fall!
The courage of our citizens which sanctified a state
The marrow of our fatherland grows old and dies away,
And once again in history the world will surely read:
How states must go to ruin when moral law they will not heed.

Later on he renounced his praise of these Alpine children of nature, for it subsequently became evident that the youthful traveler had transported himself in his poetic fervor to a beautifully conceived past, or to a place that existed merely in his fancy when he said that the shepherds prefer the sparkling water from the mountain spring to the golden wine, or the son of nature despises the gold sand in his rivers: "The shepherd sees this treasure, he merely looks at it and lets it float away." This sentimental bias and pessimistic view of civilized life was supplemented, however, by a very practical common sense view of nature on the one hand, and on the other by an exuberant optimism of a religious character. Haller believed, like Leibnitz and Pope, "Everything which exists is good and for the benefit of humanity." Thus the Alps furnish us in their vegetation with medicinal herbs, the mountains with crystals and curative springs, and the icy glaciers even are there for a purpose, in that they irrigate the surrounding country. In brief, the Creator has done everything for the best of humanity. But such doctrine made it incumbent upon him as a faithful follower of Leibnitz to work out a so-called theodicy, an explanation of God's indulgence in permitting the existence of evil at all. He good naturedly pacifies us with the assurance that God's divine kindness will work out everything for the best, whereby humanity, "the pitiable, intermediate type between angel and beast," does not become the wiser.

During the first half of the eighteenth century one fanciful theodicy followed another. The fearful earthquake of Lisbon in 1755 gave the optimists a severe blow. Voltaire, Haller's opponent, in a poem devoted to this awful catastrophe, referred to the latter as a terrible argument against the above-stated doctrine. Voltaire himself, had deduced the existence of God from the established order of creation, without resorting to such ridiculously trivial teleology as to praise the creator of the cork-tree as the furnisher of the highly useful stopper. His often quoted saying, "If there were no God he would have to be invented, but all creation proclaims his existence," should be treated with as much consideration as Haller's maxim—"Enough! There is a God, for nature doth proclaim it." But now the best sections of a flourishing city go to ruin, and in the deliciously satirical tale, "Candide," this pious hallucination is mercilessly scourged. Haller, who took pleasure in displaying his antagonism to Voltaire, had by that time already given up his poetic activity. One small volume of poems represents about the extent of it. It is this feature, in conjunction with an unusual intensity of thought, which gave to his "Swiss Poems" an epoch-making value. By way of contrast to a whole cluster of poetasters of the "quantity not quality" variety, a serious philosophic poet had made his appearance. These made rhymes after rhymes in quick succession; but he, conscientious about the wording of his verses and the creation of new forms wherever he felt the need of such, was content to complete about ten verses an evening. The former showered fulsome, insipid eulogies on their friends and patrons, but he pointed out the line of demarcation which separated his Nuptial Song to a Swiss Cato[2] from the usual cheap congratulatory poems. On the one side chaff, on the other side grain, although of a small quantity; on the one side dazzling raiment, on the other a heavy suit of armor; there prodigality, here economy, almost penury; there superficial amusement, here high ideals pertaining to life and its problems.

Haller was the first to impart force and depth to German poetry, even if he did not assist in bringing about facility of expression. One should read his truly great fragment "About Eternity," in which he portrays a desolate landscape, crags, sinister trees, a bird that has lost its way, and an idly-flowing brook—a spot where the lonely pilgrim directs his attention to the contemplation of eternity and is overwhelmed by the thought of a beginning without an end. But how can he, who is subject to finite conditions, comprehend the infinite:

On awful numbers I place numbers,
And millions of mountains I heap;
I roll cycles upon cycles and worlds upon worlds;
And when from this tremendous height
With trembling fervor I again thee seek,
O God! All might of numbers
Increased a thousandfold
Is not yet a part of Thee!

Kant cites these lines of "the most sublime German poet" in his essay on the "Infinite in Creation." To regard life from

[2] Note by J. C. H.—M. Porcius Cato, the elder, was noted as a rigid judge of morals, and this Swiss Cato must have been of the same character.

a pleasant point of view, to sing the songs of youthful gaiety, was foreign to Haller's ponderous nature. Inclined to loneliness, reserved and sensitive, lacking resiliency to experiences of a disagreeable character he kept aloof as he himself stated from a real understanding of the joy of youth. Love was to him the most serious occupation to which he devoted himself. Although penurious in his lyric effusions relating to it, he however created in his "Doris" the ideal of womanhood; his deeply-conceived elegies on the occasion of the death of his first wife and also on that of his second were evidences of his intense feeling. With this tearful offering Haller bid the world of poetry farewell.

As a Göttingen professor, soon afterwards Albrecht von Haller became famous throughout Europe as the "Great Haller." The Academy of Berlin sought him, but the free-thinking tendencies of Frederick's court were distasteful to the pious Christian. Possessed of immense learning, he devoted himself with indefatigable industry to scientific study. Histories of botany, physiology, and anatomy must each give him his due share of honor. An examination of the mural decorations of the exterior of the University of Vienna reveals his name as combining in one person the rarest abilities of the investigator and experimenter in the domain of natural science with an almost unattainable knowledge of litterature, and withal pervaded by an unusual sense of modesty. He was a veritable encyclopedia of information, "πολυμαθής," wrote for many years reviews on books relating to all departments of knowledge, at one time appeared in the rôle of a theologian, at another as a politician, and in his last period became a statesman and administrator of public affairs. He rehabilitated the poetic and scientific fame of Switzerland. The very fact that a scholar of his type should not disdain to write a volume of poems, exalted poetry and the poet in the estimation of the people.

Contributions to Anatomy and Surgery.

Albrecht von Haller must be mentioned as one of the first to investigate the etiology of septicæmia. He made the experiment of injecting putrescent substances into the veins of living animals, establishing the fact that they were rapidly killed thereby.[3]

In another direction he stimulated pure surgical research—namely, in an investigation concerning the development of a collateral circulation after the ligation of larger vessels—the larger anastomoses had in fact been made out by Haller.[4] Concerning echinococcus of the liver, Haller held the view that it was an exuberant formation of follicles.[5]

The founder of the surgery of the diseased states of the biliary passages was J. L. Petit, who recommended puncture of the gall-bladder for advanced stagnation of bile, and the removal of gall-stones by incision; but to make both operations feasible, he postulated the necessity of adhesion of gall-bladder with the abdominal wall. The first to support the views of Petit were Haller and Morgagni.[6]

Haller described exactly the invagination of the colon into the rectum and gave its differential diagnosis from rectal prolapse.[7] In writing the history of hernia as a pathological entity, it should never be forgotten that Haller clearly described the peritoneal process extending into the scrotum as the persistence of a fœtal physiological formation; opposing the view of Reneaulme, then prevalent (since 1721) that it was an abnormal place for peritoneum, for he and J. Hunter demonstrated the protrusion of the peritoneum that preceded the descent of the testicle, and argued that in congenital scrotal hernia the intestinal loops must of necessity follow the same channel. Haller correctly described a large hydronephrosis discovered by him at autopsy.[8]

His principal achievements in anatomy were: 1, a demonstration that the salivary duct discovered in 1724 by Coschwitz, was a vein; 2, an investigation of the respiratory muscles and an exhaustive description of the diaphragm, with an interpretation of the intercostal muscles as elevators of the ribs; 3, a demonstration of the uterine musculature; 4, a demonstration of the coni vasculosi, Vasculum aberrans Halleri; 5, a correct description of the musculature of the heart and an accurate description of the pericardium and of the valves in the veins; 6, a description of a number of unknown or, at least imperfectly known arteries (Tripus Halleri, triple branching of the cœliac artery, description of the course of the musculophrenic and of the internal mammary artery, anastomoses of the internal mammary with the intercostal artery); 7, the higher location above the pubes of the bladder in children; 8, a description of the omentum; 9, a demonstration of the Tela cellulosa as a connective tissue substance.

His successors in Göttingen were Johann George Roederer, 1726 to 1763; Johann Gottfried Zinn, 1727 to 1759, and Heinrich August Wrisberg. Zinn and Wrisberg, two undoubtedly brilliant anatomists, were direct pupils of Haller. Zinn has become immortal through his classical description of the eye and its surrounding Zonula of Zinn (ligament of Zinn). This illustrious pupil of Haller became professor of medicine and director of the botanical gardens in Göttingen, 1753 to 1759.

The Swiss clinician, John George Zimmermann, was also a pupil of Haller. Both Zinn and Zimmermann assisted him in his investigations concerning the brain. Among the successors at Göttingen was Samuel Thomas Soemmering, 1755 to 1830, whose comprehensive text-book is a monument in the history of German anatomy. Soemmering was undoubtedly the most talented German anatomist at the beginning of the nineteenth century. Among the other intellectual descendants of Haller are Johann Friedrich Blumenbach, the founder of modern anthropology, and Johann Friedrich Meckel. Thus

[3] Friedrich Helfreich. Geschichte d. Chirurgie. In Neuburger's and Pagel's Handbuch d. Gesch. d. Med., iii, 20.

[4] Loc. cit., p. 86.

[5] Loc. cit., p. 219.

[6] Loc. cit., p. 222.

[7] Loc. cit., p. 239.

[8] Loc. cit., p. 276.

Haller's influence extended to the entire anatomical world of his period.

Concerning the functions of the Eustachian tubes, however, he did not recognize the full truth, for he believed them to serve the conduction of sound and not as Schellhammer experimentally proved in 1716 for ventilation of the tympanum.

Exact medical historic research must credit Haller with a valuable discovery concerning the anatomy of the eye, for he was the first to describe the "lamina cribrosa" at the entrance of the optic nerve into the eye-ball (see Comment in Boerhaavii prælectis Götting. 1749), and he also, as well as Zinn, made clear the structure of the choroideal tract in the eye,[9] but he again failed to grasp the actual fact when he denied the existence of muscle fibers in the ciliary body and that they could influence the size of the pupil. But in this error he had investigators no less noted than Morgagni, Zinn, and Fontana as companions. Whilst he paved the way for a correct physiology of vision by his doctrine of the irritability of nerves, he seems to have failed in grasping what was known of refraction. As I understand Haller (Elementa Physiologica, Lib. XVI) he regarded light as a form of matter and ascribed to it a remarkable degree of substantiality.[10] Although he attributed refraction erroneously to contraction and dilatation of the pupil, his conception of the projection of the visible object on the retina was correct. It was a valuable service to the physiology of vision to emphasize the retina as the organ for light perception and not the choroid as Marriotte had argued previously.

Haller's analytical thinking and patient observation gave much new information in regard to neurological and mental diseases that eventually led to searching inquiries. In his Elementa Physiologica [11] he not only compiled that which was of interest up to that date, but added his own rich experiences and observations at autopsies. He emphasized that the brain was abnormal in all diseases of the mind and that the pathological alterations frequently extended to the cord and nerves, and he asserted that if nothing abnormal could be detected in these parts in rare cases, it should not be concluded that they were normal, but he preferred to think that the disease process was located in the "finest organizations" of these parts or that perhaps the examination had not been exact or careful.

The history of the development of gynecology would not be complete without including his anatomical, physiological, and pathological contributions, which are embodied in part of the 28th book of the Elementa Physiologica.[12]

Contribution to the Physiology of Circulation and Respiration.

One of the most definite facts of this greatest of modern medical encyclopedists, and a fact upon which all later anatomists and physiologists agree, is that by his exhaustive work in anatomy and physiology references to literary sources earlier than his time have not only been greatly facilitated but in great part have been made superfluous; *i. e.*, one need as a rule only refer to his writings to learn the views of his predecessors on any important fact in these subjects.

In his preface to his Elementa he opposes the separation of anatomy and physiology—for him they were inseparable and yet he himself was the first to make physiology independent by his objective way of thinking and the significance he gave to experiments on the living animal. Sir Michael Foster correctly says: [13] "When we turn from any writers of physiology preceding his time and open the pages of Haller's 'Elementa,' we feel that we have passed into modern times."

Microscopic work with higher powers was quite unknown to Haller, but all that could be observed by anatomical investigation simply,—even general histology,—whatever could be elicited by simple vivisection with the application of the means of stimulation known in those days—all that could be accomplished by these means are described in his Elementa in words that even to-day retain their full meaning; his facts are critically weighed and he cites the complete literature known to him.

The finer anatomical and physiological techniques of to-day were not dreamt of by him, and those processes of living matter that could only be studied by the methods and in the light of the chemistry and physics of those days were necessarily incorrectly or incompletely understood. In a study of the dynamics of the circulation whose foundation was laid by Harvey, Bellini, and Bovelli, or even earlier by Michael Servetus, Matheus Realdus, Columbus, and Cesalpinus,[14] the work and views of Haller are noteworthy. He was the contemporary of the versatile English divine Stephen Hales (1677 to 1761) a man whose mind was replete with original thought. His work on the physiology of plants and on hygiene is exceptionally meritorious, and in his work on "Hemostatics" [15] Hales describes his classical experiment of determining the hydrostatic pressure of the blood by tying a long straight glass tube into the artery of a horse. Singularly enough Haller, though familiar with this pioneer contribution, does not appear to estimate it sufficiently or correctly; in fact he does not cite Hales in his discussion of arterial pressure, although he makes use of his observations in his consideration of means "to determine the force of the ventricular systole," which perhaps was permissible in those days, for soon after more direct methods became available for this study.

Haller discusses exhaustively the determination of circulation time. He denies the so-called self-regulating mechanism of the heart, the coronary circulation, and even disproves it. This controversy arose again in the nineteenth century between Hyrtl and Brücke.

[9] C. Horstmann. Geschichte d. Augenheilkunde, pp. 496 and 497.
[10] Vide supra, p. 499.
[11] Lib. XVII, Sect. I, par. 17, Tom. V, Lausanne, 1763.
[12] Bernae, 1765; Muliebria: Sectio II, Uteri fabrica.
[13] Lectures on the History of Physiology, p. 207.
[14] Hemmeter. Johns Hopkins Hospital Bulletin, 1905, XVI, 165.
[15] Statical Essays, Vol. II, 1732.

In his description of the changes of the form of the heart during contraction and the cardiac impulse, he lays more emphasis on the changes of form than did Harvey. He shows familiarity with the influence of gravity and of the respiratory aspiration of the thorax on the circulation in the veins.

One of his most brilliant experiments as well as arguments is the demonstration of the automatism of the heart. Anatomists, physiologists, naturalists, and medical men in general at the time of Haller were under the ban of the doctrines of George Ernst Stahl (1660-1734), a brilliant metaphysical philosopher, and unfortunately for science of his day, an influential writer and man of exceptional individual force. He assumed that all physical and chemical processes in the living creature, even the very simplest, were fundamentally different from those in the lifeless world, in that they were induced and controlled by a "sensitive soul," the "Anima Sensitiva." This conception is entirely different from that of the "reasonable soul" of Descartes, by which this philosopher meant to differentiate man from animals. Stahl's "Anima" reminds one more of the "φυσίς" of Hippocrates, or the "Archæus" of Paracelsus and of van Helmont, for it is present in all that is living and disappears from it when death occurs. Stahl was the first "Vitalist" and his "Anima" was inseparable from the central nervous system. It is evident from this definition that an organ that could function when entirely separated from brain and cord was unthinkable to the medical world of Haller's day, when the doctrines of Stahl exerted a kind of tyranny over the opinions of physiologists. Now when the Bernese Aristotle with his then unassailable objective demonstrations and the force of his logic correctly proved the entire independence of the activity of the heart from the central nervous system—not only this, but even more, for he emphasized the irritability of the myocardium itself as the cause of the cardiac rhythmic activity,[16]—he dealt a killing blow from which the hypothesis of Stahl could not recover.

As said before, Haller must be credited with the first correct and complete presentation of the mechanism of respiration, for there were other prominent anatomists, Hamberger (1697-1755) for one, who held that the lung contracted by its own inherent power, like a muscle, and that the pleural space between the lung and thoracic wall contained air. Haller succeeded in preparing the costal pleura in a living animal without injuring it in the least, so that the lung could be seen through it. He showed that the lung passively expanded, whilst it followed the receding thorax and descending diaphragm. His description of the diaphragm is anatomically perfect.[17]

It is regrettable that the chemistry of respiration was a "terra incognita" to him, who like many other thinkers of his time was held perplexed in the dark maze of Stahl's phlogiston theory. He knew of John Mayo's work on Respiration, and even cites it, but he failed to understand what Mayo meant by his "Nitro-Aereal" or "Igneo-Aereal" particles. The appreciative mind of to-day reading Mayo's ideas in the light of later progress by van Helmont, Lavoisier, etc., can understand that Mayo meant that the part of the atmosphere that was essential for burning was essential for all the chemical changes on which life depends and that the "Nitro-Aereal" particles of air are the oxygen of to-day. It is questionable whether any of Haller's contemporaries understood Mayo, or even whether this English apostle of physiology was understood in his own country. I do not think it correct to assert, as Sir Michael Foster does,[18] that Haller rejected the advances of the English school (Boyle, Hook, Lower, and Mayo). He gave them fair consideration; he did not accept them; neither did he clearly reject them. He was an agnostic for the time, as most conservative thinkers should be. One must not overlook the fact that these men expressed themselves largely in terms of their own invention concerning their views of respiratory gases, and that they were unavoidably vague, and were not in entire agreement. After discussing all views known to him, Haller declines to accept the view that particles of air actually pass into the blood; but immediately thereafter warns the reader that his doubt concerning the theories of the English school "does not or should not lead to the conclusion that in breathing we derive nothing from the air."

Haller induced his disciple Rhodes[19] to write a dissertation on the iron content of the blood (Göttingen, 1753) and he attributed the red color of the blood to the iron.

The physiology of the larynx is excellently presented in his Elementa,[20] but he appears not to have known the function of the lateral cricoarytenoid muscles in opening the glottis.

Contribution to the Physiology of Digestion.

To the modern student of Haller's physiology it soon becomes apparent that the weakest points of Haller's work are where he comes in contact with purely chemical phenomena in the explanations of the processes of life, and this is not surprising, since the chemistry of today was practically unknown. It was not until after Haller's death that Scheele, contemporaneously with Priestley, discovered oxygen in 1786. I have already referred to the retarding effect of Stahl's phlogiston hypothesis, which impeded the development of chemistry fully as much as the delusion that the septum of the heart is perforated did retard the development of the physiology of the circulation of the blood.[21] Even Scheele was an ardent adherent of the phlogiston theory. It is quite pardonable, therefore, that Haller, who had no special training in chemistry and had not even been an apothecary, like some of the clinicians and chemists of his time, should have no comprehensive knowledge of the chemical progress taking place during his life and which was giving birth to a new

[16] Elementa, Vol. I, p. 488.

[17] De diaphragmate. Göttingen, 1791.

[18] Loc. cit., 230.

[19] Borettan, Gesch. d. Physiol. (Julius Pagel writes this name Rhades) in Part I of Neuburger's and Pagel's Gesch. d. Med.

[20] Vol. III, p. 366.

[21] Hemmeter. Johns Hopkins Hospital Bulletin, 1905, XVI, 165.

chemistry under the stimulus of Black, Mayo, and Priestley in England and Lavoisier in France.

This same defect in interpretation we find in Haller's presentation of the functions of the digestive organs, where we find many erroneous conceptions; but his description of digestion is distinctly in advance of the time. The activity of the salivary glands as dependent upon nerve influence (irritation by smell or taste) is an idea that does not appeal to him, although he concedes a certain degree of irritability to the salivary glands. To him the saliva is neither alkaline nor acid, and he interprets its function to be merely a mechanical one to aid in the formation of the bolus and facilitate swallowing. He does not know its starch-digesting property, for ptyalin was not discovered until 1831 by Leuchs.

The glands of the stomach furnish only mucus according to Haller. The gastric juice is a kind of transudate from the arteries; it is neither alkaline nor acid, but neutral. Acid is not present in the stomach normally; if present at all it is derived from abnormal decompositions of the gastric contents. In the sixth volume of his Elementa, page 57, he looks with disfavor on the use of the word "ferment," to explain the action of the gastric juice, which is, according to him, much assisted by the grinding and mechanical effects of the movements of the stomach.

The various functions of the pancreas are not known to him. Though he speaks of neutralization (Milderung) as being one of them, he does not mean neutralization of the gastric juice but of the bile.

The bile he considers to be an especially effective secretion for digesting the fats, which he declares are immediately emulsified by it. It is according to him not an excretion but a secretion and this he attempts to demonstrate by the effects of excluding bile from the intestinal canal. It was still thought by many physiologists that bile was produced in the gall-bladder, but he was an opponent of this belief, as he knew that bile is produced in animals who have no gall-bladder. In this connection he emphasized the importance of comparative physiology. In connection with his doctrines concerning digestion, his discussion of the foods and diet of human beings are very interesting, but naturally imperfect in the light of our present knowledge.[22]

His description of the structure and the gross functions of the kidneys is admirable, but the chapter on the urine (this being again a chemical subject) is in accordance with the deficient knowledge of those days.

Contributions, Views, and Experiments Concerning the Central Nervous System.

Haller's work on the brain and spinal cord will be better understood after his doctrine of irritability has been studied. In testing the irritability of the brain and its membranes he frequently went too far, because of the incompleteness of his methods and crudeness of his instruments. A part of his first brain studies were upon the cerebral pulsations. In 1750 the Dutch physician Schlichting had shown that the pulsatory movements of the brain were caused by the activity of the heart and the respiratory movements, but at the same time had been led to assume a kind of independent brain movement. The question was taken up by the Paris professor Lorry, 1725-1786, who disproved the theory of an independent movement of the brain, but at the same time held that the brain pulsations were pathological. Haller[23] attributed the brain pulsations to venous stagnation. In his experiments on the gray cortex of the brain, he was assisted by his pupils Zinn and Zimmermann. The physiological techniques of these experiments were very faulty viewed from our present standpoint. They made use of needles and sticks of wood saturated in acid, which were stuck into the gray matter. It is not surprising that they always obtained the same results, namely collapse of the animals, and convulsions—the well-known epileptic attacks when the cortex is stimulated too powerfully. He considered the gray cortex as devoid of sensibility and attributes positive sensibility only to the white medullary substance. Thus he is opposed to ideas of localization, the beginnings of which had already been made by other physiologists. He recognized that the cerebellum, by carefully conducted experiments, could not be proven to be an organ that is essential to life,—that is, not more so than the cerebrum; but he conceded the great importance of the medulla as a portion of the brain that was immediately essential to life. This concession was, however, forced from him by his brilliant pupil Zinn. Lorry had shown that the only locality in the whole central nervous system through which convulsions could be caused invariably—that is of course after clean and careful experimentation—was situated in the medulla oblongata. Isolated injury of this spot could cause death, according to Lorry, and Haller recognized this also. Another epoch-making discovery he confirmed without reservation: the discovery of the contralateral innervation, by the French physician, Pourfour du Petit (1664-1741). This brilliant observer accurately described the crossed paralysis which occurred in trephined animals whose cortex had been injured on one side, and then demonstrated the decussation of the pyramids. There had been some intimation that such a crossing of the motor fibers probably existed, for the ancients had already described autopsy findings in persons who had died of apoplexy which foreshadowed the great physiological discovery of Pourfour du Petit.

The New Conception of Irritability as First Presented by Haller.

In presenting this new aspect of living matter as first conceived by Haller it will be necessary to review the opinions helds on this same subject by physiologists prior to him. Sir Michael Foster says "And to call attention to the general view of Glisson's because this was the mother idea which led him to a special conception of the properties of muscular tissue, through which he anticipated modern teaching by nearly

[22] Elementa, Vol. VI, pp. 188, 258.

[23] Elementa, Vol. IV.

a hundred years. In his work on the liver, in discussing how it comes about that the bile is discharged into the intestines at certain times only, namely, when it is wanted, he shows that the gall-bladder and biliary duct bring about a greater excretion when they are "irritated." And he argues that they cannot be irritated unless they possess the power of being irritated. This power of being irritated he proposes to denote by the term *irritability*. And he develops this view again in his work on the Stomach (De Ventriculo), published the year of his death, though wholly written as early as 1662, but laid aside in order that he might devote himself to his work "*De Natura.*"

"Thus it is undoubtedly to Glisson that we owe the first introduction not only of the word but of the idea of irritability, which, revived by Haller, as we shall immediately see, in the next century became firmly established in physiology and has played an important part in the development both of physiological and pathological views. Haller used the word in its narrower sense as the property through which muscle responds by movement to an external stimulus; since then it has been extended to mean response in any way, not by movement or change of form only but by kind of change, chemical change, change of growth, and the like. And it is worthy of note that Glisson from the very first used the word in its widest sense, distinguishing the various ways in which irritability may be manifested and the various agents by which it may be called forth."

It was perhaps by reason of the fundamental and highly philosophical character of Glisson's conception that it did not meet with immediate recognition. The idea had to be put forth in the narrower form, which Haller gave it, in order to be understood by physiologists; but to continue to use a comparison of Sir Michael Foster's: "Glisson's irritability and his notable experiment were like Mayo's igneo-aereal spirit forgotten as the seventeenth century passed into the eighteenth. We have to wait until the latter century, when the truth was brought to light again by the sagacious Haller in his views of nervous action and its relation to muscular contraction."

From this narrative it is evident how the merits of an older investigator may be overlooked in the future development of a new discovery. Glisson was undoubtedly correct in the broader conception and application of the term irritability. Haller's inseparable connection with this discovery is, however, justified through the large number of objective demonstrations and experiments by which he succeeded in proving this new quality of living matter. To us of the twentieth century it might occasionally seem as if irritability had from time immemorial been one of the primordial conceptions of natural philosophers; and yet this property which at the present day appears as one of the most natural attributes of living matter was not even dreamt of before the days of Glisson nor understood before the days of Haller. The introduction of the idea into physiology constituted as great an innovation and brought about as many reforms and advances in physiology as did the conception and development of the new physical chemistry of our present day.

The most correct course to pursue in speaking of Haller's views concerning irritability will be to quote his own words in his Elementa: "There is widely present not only in the animal, but also in the vegetable kingdom, a contractile force by which the elements are brought nearer to each other. This not only seems to be the cause of cohesion in general, but is rendered manifest by the fact that a fiber drawn out lengthways when let go very soon returns to its previous length." This is more properly the elastic force. Besides this there is a contractile force by which the tissues dead or alive shrink when treated in various ways, when for instance they are heated. A contractile force of such a kind is present in almost all animal tissue, unless it be very soft and pulpy ones like brain, or very hard ones like bones and teeth. But there is in addition a special contractile force proper to muscles alone. "In a living animal or one only just dead there very frequently appears spontaneously in muscular tissue a swift contractile movement by which the ends of the muscle are alternately brought nearer to the middle belly and then again recede from it. And even when this contractile movement does not spontaneously appear, it may be excited if a stimulus, such as pricking, or pinching, or some chemical substance is applied."

"Many writers consider this living contractile force as identical with the dead one just described as belonging more or less to all tissues." This view Haller discusses and concludes, "That muscular fiber is the only one which is moved spontaneously in the living animal, or is brought by irritants from rest to movement," and that "the living contractile force must be held to be distinct from the dead contractile force, since the two agree neither in the laws which govern them, nor in their duration, nor in their seat."

This force he calls Vis Insita, the Inherent Force, and the tissues possessing it he calls after Glisson "irritable."

He then discusses whether this property of irritability is identical with that of feeling, and concludes that it is not. "There are many parts which feel, but which are not irritable, and in particular, a nerve, which is above everything sensitive, and yet possesses no contractile force except that common one found, as stated above, even in dead things.

"Wherefore this force since it is different from mere elasticity and from that dead contraction which is common to all fibers, seems to constitute a peculiar property, proper to the muscular fiber, and indeed to mark the character of that fiber, so that every muscular fiber is irritable, and on the other hand you may fairly call muscular fiber everything that is irritable. It is, however, a force of its own kind, different from every other power, and to be classed among the sources of production of motion, the ultimate cause of which is unknown. This same force is inherent in the fiber itself and not brought to it from without.

"I (by my experiments published first in 1739, and again in 1743) separated this irritable nature on the one hand from a mere dead force, and on the other from the nervous force and from the power of the soul. I shewed that the movement of the heart and the irritable nature of the intestines

depended on it alone. I confined it entirely to the muscular fiber, in which point the Batavian school does not agree with me, but they will I hope do so when they are willing to distinguish the contractile force common to all animal fiber from the irritable force proper to muscle alone. I also shewed that that force was something perpetually living, and that it often broke out into movement though no external stimulus such as could be recognized by us was acting. By a stimulus, however, it could at any time be called back from rest into action. In a movement produced through it I distinguished between the stimulus, which might be very slight, and the movement called forth by the stimulus, which might be very powerful."

"Some," says he, "have wished to call this force the vital force, but this does not quite please me, since the force may for some little time survive the life of the body. Hence I prefer to call it the force inherent in or proper to muscle."

Further on he says: "Besides this force inherent in muscular fiber, another force is exercised in it, so far like the former that it alone has its seat in muscular fiber. But it is different from the inherent force inasmuch as it comes from without and is carried to the muscles from the brain by the nerves, it is the power by which muscles are called into action." This he calls the Vis Nervosa. "It too may survive the death of the body, and in cold-blooded animals is of the same constancy as the inherent force; so that in such an animal recently killed, in which no sensation or voluntary movement remains, a muscle, provided it be moist and whole, is thrown into convulsions when its nerve is irritated. And the same is true of warm-blooded animals." Haller reached these conclusions by countless experiments upon the animals, the results of which he reported to the Göttingen Scientific Society, under the title of "De partibus corporis sentientibus et irritabilibus."

In his Elementa, Vol. IV, page 532, he described exhaustively all older theories of muscle contraction and emphasizes that the nerve has no inherent contractility of its own, nor can it move actively in any way, as had been asserted before his time. He reports concerning all former conceptions of the nature of nerve function and declines to believe the electrical hypotheses that arose for the first time in those days, and appears more willing to accept a theory explaining nerve function by the flowing of an actual nerve spirit, not in a gelatinous substance as Borelli thought, but in actual tubes.

In observing the expressions of pain and the movements of defense in the animal during his experiments on irritability, he finds that the sensibility of the various organs depends upon their wealth of nerves. The muscles also possess sensibility, side by side with irritability. The tendons and joints, according to him, do not possess sensibility to a marked degree and the peritoneum very little sensibility. The incompleteness of his physiological technic brought it about that he frequently went too far, particularly with his experiments in stimulating the dura mater and pia mater, as well as the cerebral cortex.

A Character Study of Haller.

To discern the intellectual peculiarity and the inner character of all human beings that have achieved greatness is always a difficult problem. One of the principal features in our philosopher and naturalist is his astonishing pleasure in detail and the second most prominent trait is his unusual joy and power of observation. Biographers frequently speak of the secret of the individuality, and correctly so. It is a secret, but not because individuality is the work of forces which are more subtle and puzzling than other forces. The riddle consists in the abundance and complication of the many coacting forces into which we can very rarely gain exhaustive insight. According to Theodor Gompertz (Griechische Denker) we might distinguish two fundamental types of world sages. In one there is a preponderance of thirst for fullness of knowledge and an insatiable reception of ever new and manifold material of insight. In the second, the most prominent feature is the striving toward inner freedom from contradiction, toward unconditional mental consequentialness and consistency. Insatiable thirst for knowledge on the one hand, and the desire to have a mind free from contradictions, a so-called logical and orderly mind on the other hand, are not necessarily diametrically opposed to each other. The two represent evidently only differences of degree, but the difference is for that reason none the less real. For a critical study of the state of the inner mind of great human beings reveals the surprising fact that these two qualities are rarely present in one and the same individual. Thinkers like Descartes or Spinoza, who erect a homogeneous and uniform thought structure, stone for stone, idea upon idea, and two detail workers like Aristotle and Leibnitz, who are ceaselessly engaged in special investigations of every kind, represent two deviating varieties of a common genus; for the sake of argument we may designate those engaged in restless detail work, the encyclopedists. This human mind may try ever so hard in seeking strict limitation and definiteness of his thought structure, for clearness in the inner arrangement of his mind, yet he will never be as successful as an equally versatile intellect that is not animated by so strong a desire for fullness of knowledge, and hence not equally distracted. Insatiable thirst for knowledge in the encyclopedist must, however, eventually bring about a tendency toward clearing up of his thoughts. Such a man will serve the requirements for the arrangement and the systematization of an enormous mass of knowledge. The encyclopedist will meditate upon and invent artifices and tricks controlling the material of thought. An example of this we have in the language of concepts of Leibnitz; or the encyclopedist will become a classifier and systematizer, and as a matter of fact we find that all great human beings with a comprehensive grasp of knowledge tend toward this achievement. Classification and systematization were the great intellectual feats of Aristotle and Humboldt. But strangely enough the best biographers of both of these do not concede that they accomplished research work of enduring excellence. Aristotle was not a research worker in

the modern sense of the word; his interpretation of actual facts is often wilful and controlled by preconceived opinions. His interpretations show the inexhaustible resources of a head rich in inventive power, rather than the severe training of a mind that conquers its intuition and bows under the hard yoke of facts.

In Haller, however, we find for once a human intellect eminently fitted to serve classification and systematization; he has an orderly, logical, or consequential mind, and an insatiable thirst for fullness of knowledge, but it is conceded by the most capable judges of the present day that he was a research worker "par excellence."

The life of Haller and his works put to shame the sixteenth aphorism of Heraclitus.

'πολυμαθίη νόον ἔχειν οὐ διδάσκει.

(Too much knowledge does not give understanding or insight.)

His life rather reminds one as fitting to the celebrated aphorism of Hippocrates,

''ὁ μὲν βίος βραχὺς ἡ δὲ τέχνη μακρά.''

(Life is short, but art is long.)

PRIMARY HEMANGIOMATA OF MUSCLE.

By John Staige Davis, M. D.,

Assistant Surgeon, Out-Patient Department, Johns Hopkins Hospital.

This paper is based upon one personal observation in which a rather extensive hemangioma of the leg was considerably improved after a simple exploratory incision and separation of the muscles, and five cases subjected to operation in Prof. Halsted's clinic of the Johns Hopkins Hospital. These patients have been entirely relieved. In three cases the tumor was completely excised (thigh, abdominal wall and cheek), in two (forearm and calf) there was only partial excision. A review of 129 cases recorded in the literature, making in all 135 cases, is added. Cases I, II, and III are outlined in Bloodgood's pamphlet on Benign Tumors, published in Progressive Medicine, 1903-1905.

I take this opportunity to thank Dr. Bloodgood and Dr. MacCallum for suggestions and assistance in the preparation of this article.

Case I.—Surgical No. 5051, Pathological No. 1215.

Diagnosis.—Intramuscular hemangioma of thigh (quadriceps muscle). Excision. Recovery.

Admitted to the Johns Hopkins Hospital, January 20, 1896.

Clinical History.—White, male, 18 years old, umbrella-maker.

Personal and Family History.—Unimportant. Three and a half years ago the patient observed a swelling on the medial side of the anterior surface of the lower third of the right thigh, about three inches above the patella. The tumor was not painful except after standing up for a long time. As a rule it was soft, but when the muscles contracted it became hard. An operation for the removal of the tumor was performed about a year ago by a doctor outside of the hospital, and the patient was told that the growth was in the muscle itself. Three months after this operation there was a return of the swelling.

Physical Examination.—This was negative except for the right thigh which presented the following condition: There was a tumor about 10 cm. in length by 4 cm. in width, corresponding in a general way to the area described above. There is a scar 6 cm. in length over the tumor, and the skin around the scar is made prominent by the tumor. The mass seems to be somewhat circumscribed, and gives the impression of being within the sheath of the quadriceps muscle and slightly adherent to the bone. It is soft and feels like a lipoma. It does not pulsate, and there is no note as to compressibility, although probably it was compressible as it diminished in size when the leg was elevated and increased in size when the patient stood up. There was no general swelling of the leg or thigh, but 6 cm. above the patella the right thigh was 5 cm. larger than the left. We have before us the clinical picture of a benign tumor.

Urinary Examination.—Negative.

Operation, Dr. Halsted, February 1, 1896. Ether anæsthesia. Tumor exposed by free incision. It had the appearance of a sponge and was made up of numerous dilated vessels, which were filled with blood. It was situated in the quadriceps muscle (vastus internus), and was surrounded by fibrous tissue, which was also quite abundant between the vessels. Possibly much of this fibrous tissue may have been the result of the first operation. The entire angiomatous area in the muscle was excised. Wound closed with silver wire. Silver foil and gauze dressing. Healing per primam. Convalescence uninterrupted. Discharged February 18, 1896.

Gross Pathology.—The mass measures 5 x 4 x 4 cm. The tissue is red and compressible like a sponge. On section it is composed in places of loose and in others of dense fibrous tissue, surrounding spaces filled with blood. This vascular spongy tissue can be seen to infiltrate between the bundles of muscle removed with the tumor. In the center of the tumor there is a cavity like a blood cyst filled with blood.

The naked eye appearance can be well made out in the alcohol specimen. Muscle, increased intermuscular fibrous tissue and spongy angiomatous tissue.

Microscopic Examination.—Report of Dr. Bloodgood. Intermuscular hemangioma, Pathological No. 1215.

In one section there is muscle, fat, and blood spaces The spaces have an endothelial lining and contain blood. The wall is composed of fibrous tissue with spindle-shaped nuclei. In some of the larger blood spaces part of the cavity is filled with blood while the remaining cavity is occupied by cellular granulation tissue which may be looked upon as organization of the thrombus. Where the vessels are few the muscle is about normal, but in the neighborhood of vessels the connective tissue between the muscle bundles is increased, there are more cells and the muscle shows beginning atrophy. In other places there is an excess of normal fat between the bundle of muscles.

In a second section interstitial myositis predominates in the picture, with numerous lymphoid areas. The vessels are smaller and the majority are thrombosed and the thrombus organized.

In a third section vascular fat replacing muscle is the chief tissue. The vessels in this fat are more numerous than normal and have the thick wall seen in the vessels of the previous two sections. None of the vessels show thrombosis.

Numerous other sections show about the same picture.

There is therefore between the muscle bundles a new formation of endothelial lined blood spaces with thick walls. In some areas there is thrombosis with organization of the thrombus. Accompanying this process there is interstitial myositis with atrophy and substitution of muscle tissue by fat.

After History.—The patient was examined again on December 19, 1902. The wound which was healed when he was discharged has given him no discomfort since. There is no restriction of motion at the knee-joint, and apparently no weakness of the quadriceps muscle. There is a depressed scar beginning above the patella and extending about halfway up the thigh. Beneath the skin in this area there is apparently no muscle tissue. When the muscles contract there is a depressed cavity in this area with a strong bundle of muscular tissue on each side. In the centre of the scar there are two dilated veins beneath the skin, the only evidence of the original tumor, there being no sign of angiomatous tissue in the surrounding muscle. The result can be considered a perfect one.

Case II.—Surgical No. 5809, Pathological No. 1491.

Diagnosis.—Intramuscular cavernous angioma of calf (gastrocnemius muscle). Deformity. Partial excision. Recovery.

Admitted to the Johns Hopkins Hospital July, 1896.

Clinical History.—White, female, 25 years old, teacher.

Family History.—Tuberculosis.

Personal History.—Unimportant.

Fourteen years ago when 11 years old she noticed that she walked on the toes of the left foot. There was no pain. This equinus position has gradually increased and she was unable to put her heel on the floor even with the strongest effort. Up to two months ago there were no other symptoms. Then for the first time she felt pain and tenderness in the calf of the leg, and on examination found the swelling.

Physical Examination.—This was negative except as noted below. The left foot is held in position of extension (talipes equinus). The middle third of the calf is symmetrically larger than that of the right leg. The skin is normal. The swollen area appears to be of the muscles themselves, and is rather diffuse, soft and slightly compressible. Above and below the swelling the muscles are somewhat atrophied, soft and flabby. A diagnosis of chronic myositis was made, and the tendo Achillis divided on July 3, 1896, to correct the talipes equinus. Plaster of Paris dressing.

Discharged July 23, 1896. Improved.

Readmitted September 8, 1896, because of inability to use leg with any comfort, due to increase of pain and tenderness in the calf.

Examination as above except that foot can now be flexed. Extending from the tendinous portion of the gastrocnemius muscle well up to its origin the swollen area feels hard and irregular in outline. It seems intimately incorporated in the muscle. It does not give the impression of a new growth, but rather that of semichronic inflammatory swelling. Deep pressure is painful. There is no swelling of either ankle or knee.

Urinary Examination.—Negative.

Operation, September 9, 1896, Dr. Finney. Ether anæsthesia. Esmarch bandage. On dividing the aponeurosis of the gastrocnemius muscle numerous large veins were exposed, and then angiomatous tissue made up of large and small cavernous spaces and dilated veins. The stroma of the angiomatous tissue was fibrous. The growth had infiltrated between the individual muscle bundles, and these bundles appeared soft and fatty. The gastrocnemius was involved from its tendon to its head, and the operation consisted in the removal of most of the angiomatous tissue and some of muscle. Wound closed with silver wire. Silver foil and gauze dressing. Healing perfect. Convalescence uninterrupted.

Discharged October 8, 1896, walking with a stick.

No gross pathological description except as above.

Microscopic Examination.—Report of Dr. Bloodgood. Intermuscular hemangioma, Pathological No. 1491.

There are no new sections of this case and no material from which they can be made. The one old section shows the histological appearance practically identical with the case just described.

I saw both of these cases in the fresh and remember the appearance distinctly. Between muscle bundles there was a red spongy tissue from which blood could be expressed, and this tissue invaded the muscle irregularly. It was greatest in amount between the larger bundles of muscle. Where the angiomatous tissue was most abundant and the blood spaces were larger, one could see the thicker walls and make out the presence of a larger amount of fibrous tissue. In some of the larger vessels the thrombus was quite apparent to the naked eye.

The replacement of muscle tissue by fat was most evident in the case in which the lesion was situated in the gastrocnemius muscle.

After History.—In March, 1898, the patient writes that she is perfectly well, and can walk miles without pain or discomfort. In December, 1902, six years after operation still perfectly well.

Case III.—Surgical No. 11,570, Pathological No. 3559.

Diagnosis.—Intermuscular hemangioma, between and partially involving flexor muscles of forearm. Post-traumatic. Partial excision. Recovery.

Admitted to the Johns Hopkins Hospital February 20, 1901.

Clinical History.—White, male, 17 years old.

Family and Personal History.—Unimportant.

Duration of trouble 10 years following injury of the arm. In falling the forearm was suddenly and forcibly flexed on the arm. Immediately he observed a painful general swelling and soon a small lump appeared on the flexor surface of lower third of forearm. Both the posttraumatic general swelling and the lump entirely disappeared in a few days. For two years he had intermittent attacks in which the forearm felt stiff, but no swelling was noticed. For eight years there was absolutely no sign of trouble. About one year ago, without any apparent reason, the forearm began to swell, and a tumor about the size of a pea appeared at the sight of the original traumatic tumor. Then other similar tumors appeared beneath the skin on the flexor surface of the forearm. The last swelling to appear was that in the palm of the hand. There was no pain complained of.

Physical Examination.—Negative except in part involved. There was general increase in the size of the forearm. Beneath the skin on the flexor surface of the forearm, and extending beneath the annular ligament to the palm of the hand there was an irregular rather soft compressible diffuse swelling. When the arm is lowered the swelling increases a little in size, and a slightly bluish color can be seen through the skin; when raised it decreases somewhat in size. The subcutaneous veins are not markedly enlarged. The tumor becomes firmer, larger and less compressible if an Esmarch bandage is placed around the arm. It does not pulsate. The clinical picture is one of angiomatous tumor. A tubercular synovitis of the tendon sheaths of flexor muscles with encapsulated fluid might give a picture somewhat like this.

Urinary Examination.—Negative.

Operation, Dr. Halsted, February 26, 1901. Ether anæsthesia. Incision over tumor on anterior surface of the forearm. A mass of enlarged and tortuous veins was found between the superficial and deep flexor muscles. There was not very extensive involvement of the muscles, although there was definite angiomatous infiltration. All of the angiomatous tissue that it was possible to excise was removed. Wound closed with silver wire, dressed with silver foil and gauze. Rubber protective drain lower angle.

Later the wound filled with blood-clot and broke down. Healed by granulation without infection.

Patient was discharged on March 13. Wound not quite closed over. Motion of fingers perfect.

Gross Pathology.—In the alcohol specimen one can make out muscle, fat, connective tissue, and angiomatous tissue, the lumen of some of vessels being 2 to 3 mm.

Microscopic Examination.—Report of Dr. Bloodgood. Intermuscular hemangioma, Pathological No. 3559.

The histological appearance is so similar to Pathological No. 1215 that it seems unnecessary to duplicate the description.

In both cases the histological findings suggest that the vascular tissue was present first between larger bundles of muscle, and later infiltrated the different bundles. Where the muscle is normal the vessels are small with thin walls and there is no evidence of reactive inflammation. Where the vessels have thick walls we see interstitial myositis up to complete atrophy of muscular tissue. But now and then one observes an island of fairly normal muscle surrounded by this fibrous tissue which forms the wall of blood spaces. Thrombosis with organization of the thrombus is observed only in those areas in which the vessels have thick walls.

After History.—A letter from the patients' doctor in December, 1902, nearly two years after the operation says, "the forearm is flattened where the angioma was removed, and the hand is carried a little flexed. He is working as a coachman. His arm is strong, and the result is satisfactory."

Case IV.—Surgical No. 14,552, Pathological No. 4750.

Diagnosis.—Intermuscular hemangioma of abdominal wall (external and internal oblique muscles). Excision. Recovery.

Admitted to the Johns Hopkins Hospital April 2, 1903.

Clinical History.—White, male, 5 years old.

Personal and *Family History* unimportant. A tumor was observed by the patient's doctor during his first year, near the junction of Poupart's ligament and the anterior superior spine on the left side. He has seen it several times since, and during the last year it has grown considerably. There is no note as to pain.

Physical Examination.—This was negative except that the heart showed marked irregularity in its action.

Special Examination.—On the left side there was a definite tumor, 8 cm. long by 5.5 cm. wide, slightly hour-glass in shape, being somewhat narrower opposite Poupart's ligament. It was situated over the anterior superior spine, extending above it, and also downward over the outer third of the ligament. Its most prominent portion did not extend more than 1.5 cm. above the abdominal wall. The skin over the tumor was a trifle more bluish than the surrounding skin, and contained a few dilated veins. It is not adherent. There was no sign of inflammation. Considerable tenderness was complained of when the mass was pressed against the ilium, and any attempt to cut off the circulation caused pain. There was no pulsation and no bruit could be heard on auscultation. The mass was definitely lobulated and seemed made up of tortuous thin walled veins. In several places, especially just above and inside of the anterior superior spine, is a deposit of calcareous material, the largest mass being about the size of a pea.

The upper limit of the tumor is ill defined, being lost over the crest of the ilium. At the lowest part of the tumor, about 2 cm. outside of and a little above the femoral ring, the veins are nearer the surface and easily seen. The picture presented is that of an angioma with phleboliths. Urinary examination is negative.

Operation, Dr. Halsted, April 4, 1903. Ether anæsthesia.

A free incision over the tumor was carried down dividing the external and internal oblique muscles, close to their attachment to the anterior superior spine. A cavernous angioma was found situated in these muscles and extending under Poupart's ligament. There were also found numerous dilated vessels which bled freely. In order to remove the entire growth it was necessary to chisel off a portion of the ilium, in addition to the excision of the angiomatous portions of the muscles and fascia. Several phleboliths were found. After the bleeding was stopped, the oblique muscles were sutured with silver wire and silk over the edge of the ilium here and there, to prevent subsequent hernia. Skin closed with silver wire. Small protective drain. Silver foil and gauze. Healing per priman. Convalescence uninterrupted. Discharged April 24, 1903.

Gross Pathology.—The mass measures 5 x 5 x 3 cm. It is red and compressible like a sponge. On section it is seen to be made up of fibrous bands separating numerous irregular spaces. Some of these cavernous spaces are filled with blood clot. The spongy tissue can be seen to infiltrate between the muscle bundles. There is considerable increase in connective tissue. Several phleboliths are seen as well as a band of cartilage, the latter having been removed from the ilium.

Microscopic Examination.—Report of Dr. MacCallum. Intermuscular hemangioma, Pathological No. 4750.

The tissue is composed of a rather loose œdematous fibrous tissue in which there are abundant large spaces lined with endothelium and containing blood. These spaces are very irregular in outline and in size and anastomose very freely with one another. They occasionally show in their interior isolated masses of connective tissue covered with endothelium, which are evidently cross sections of papillary projections. The walls of the blood spaces are quite richly supplied with smooth muscle fibers, which bear intimate and definite relation to the space itself. There are also isolated bundles of smooth muscle fibers scattered about in the fibrous tissue between the blood spaces. In some of the blood spaces there are extraordinary thickenings of a fibrous nature in the walls. These have the appearance of sclerotic patches, seen in artery walls, and taken in general a bluish stain. On section they form lenticular thickenings of the wall of the blood channels, and they are possibly analogous, anatomically at least, to arteriosclerotic changes. In parts of the tissue between the blood channels, numerous voluntary muscle fibers are scattered and degenerative changes may be traced in these which lead to the final disappearance of the fibrillar substance, so that they are left mere masses of protoplasm with abundant nuclei, which then look like giant cells. At one point there is a phlebolith, the central portion of which is composed of amorphous granular material, while the rest is grown through everywhere by connective tissue cells.

After History.—A letter dated January 23, 1908, from this patient's doctor says, "the child is in splendid health and has had no trouble of any kind since the operation."

Case V.—Surgical No. 21,790, Pathological No. 8691.

Diagnosis.—Intramuscular hemangioma of cheek (masseter and buccinator muscles). Excision. Recovery.

Admitted to the Johns Hopkins Hospital, January 6, 1908.

Clinical History.—White, male, 23 years old, candy maker.

Personal and *Family History* unimportant. When 5 years old (18 years ago), the patient was severely injured by falling off a horse, several bones being broken and the left cheek injured. The swelling on left cheek has remained since the injury. The size and consistency of the tumor varies, and sometimes when at work it becomes hard and painful. At times by massage, it can be made almost to disappear, but never entirely. The pain is never severe and only occurs on exertion. About a year ago the swelling was lanced by a doctor and only blood was evacuated. He was told it was a network of veins, and it was poulticed, but only temporarily reduced in size. He now seeks relief largely for cosmetic effect.

Physical Examination.—This was negative, except for a slight systolic murmur at apex and base.

Special Examination.—The left cheek is symmetrically swollen, the swelling being most noticeable 3 cm. in front of angle of jaw, and 1 cm. above the ramus, and covering an area of about 5 x 2 cm. The skin over it is normal and not adherent. The mucosa on the mouth side is also normal. It is slightly tender, quite soft, and is not connected with either the upper or the lower jaw. Near the upper jaw there is a small pea-like nodule, which is hard and smooth and moves about quite freely. It seems nearer the mucosa than the cutaneous surface. On careful palpation one can also distinguish a separate, movable, soft, and slightly compressible mass (about 2 cm. in diameter) which feels somewhat like fat. A filiform probe was introduced into Steno's duct, and passed back to the parotid gland, the duct being readily palpated on the probe throughout its length. There was no thickening nor induration along the duct, and the tumor mass was not connected with it. The small hard nodule just described, was above the duct and separate from it. A diagnosis of angioma was made.

Urinary Examination was negative.

Operation, Dr. Finney, January 13, 1908. Ether anæsthesia.

The tumor, with portions of the muscle, was completely excised through a horizontal incision in the cheek, and was found to be a large cavernous angioma, involving the masseter and buccinator muscles, and probably some of the smaller muscles of the cheek, although these could not be identified. The tumor extended from the malar bone back almost to the ascending ramus of the jaw. Three phleboliths were found. There was considerable hæmorrhage. The wound was closed with interrupted silk sutures. Small protective drain, silver foil, and gauze dressing.

Drain removed in 24 hours, and stitches in 48 hours. Healing per primam. Discharged January 16. To return for observation.

Gross Pathology.—The mass presents the picture of a typical cavernous angioma with red spongy tissue and great increase of fibrous connective tissue. The spaces are very irregular, and are separated by fibrous bands. They contain blood. Several phleboliths are seen.

Microscopical Examination.—Report of Dr. MacCallum. Intermuscular hemangioma. Pathological No. 8691.

The specimen is made up of spongy tissue. The ramifying spaces of which are lined with endothelium, and are filled with blood. These spaces anastomose very freely with one another and are entirely irregular in size and form. In many places the intervening tissue appears in the section in the form of isolated masses lying free in the blood filled space and covered with endothelium. Generally such masses have a central artery. One or two of the blood spaces contain thrombi. In one instance it was almost completely organized and permeated by new-formed blood capillaries. The tissue itself between the blood spaces, is composed of fairly dense fibrous tissue with quite abundant minute blood-vessels. There is a good deal of blood pigment scattered in this tissue, but wandering cells are not abundant. Indeed the cells of the tissue itself are not abundant, but it is composed chiefly of wavy fibers which take a deep eosin stain. There are occasional isolated bundles of smooth muscle fibers in the tissue forming the walls of these anastomosing channels. This is very irregularly arranged. At one point in the section, there is a large round mass, composed of concentric layers of dense hyaline fibrous tissue. In the center this has lost all cellular structure, and is converted into a homogeneous, gray, granular material. The outer layer shows some blood pigmentation.

Both of these cases are good examples of cavernous hemangiomata of muscle.

After History.—As this goes to press, there is still some post-operative swelling of the cheek, which is becoming less from day to day.

Case VI.—

Diagnosis.—Varicose veins of leg. Excision. Recovery. Venous angioma of muscles of the front of the leg (tibialis anticus, extensor longus digitorum, extensor proprius hallucis, and peroneus tertius) found at operation for excision of veins. Exploration. Improved.

Admitted to the Robert Garrett Children's Hospital, June 23, 1905.

Clinical History.—White, female, 12 years old, schoolgirl.

Family History.—Negative.

Personal History.—Unimportant, except birth after prolonged labor and forceps delivery. Has always been well. Several days before admission she scratched one of the enlarged veins on her leg, and profuse hæmorrhage followed. She has had trouble with the left leg since birth, the veins having always been swollen. In October, 1901, she was admitted to the Johns Hopkins Hospital for profuse hæmorrhage due to scratching dilated vein. The superficial veins of the outer side of leg, which were much enlarged, were divided and tied at that time. Healing per primam. Convalescence uninterrupted. There was little permanent improvement following this operation. She says, "the leg does not swell, and there is no pain except on striking it."

Physical Examination.—Strongly built, well nourished girl. Normal throughout except in the leg affected.

Urine shows trace of albumin, otherwise negative.

Special Examination.—Left leg. No bleeding point or evidence of ruptured vein. Just below and to outer side of the knee is a T-shaped scar of the old operation. Superficial veins of leg are considerably enlarged. There is slight general swelling with several nodular areas at various points, which are tender on pressure. One of these at the intersection of the lines of the T-scar is small, hard and very tender, and gives the impression of a foreign body. There are three others, one in front of the middle third of the leg, one on the inner side of the lower third, and one in front of and extending a little below the external malleolus. These average about 4 cm. in diameter, are raised about 1½ cm., and are roughly in circular in shape. They are somewhat compressible and depend on the venous circulation, in as much as they become larger as the patient stands up. On the inner aspect of the swelling on the lower third of leg there is a hard nodule about the size of a bean. There is a small bunch of enlarged veins outside of the ankle and above the malleolus, otherwise the skin has a normal appearance. The kneejerk is not exaggerated. Muscular power of the leg is good. Child walks without limping.

Measurements.—Lying down: Right leg below knee, 25 cm.; right calf, 25.5 cm.; right ankle, 18 cm.; left leg below knee, 26 cm.; left calf, 26 cm.; left ankle, 19 cm.

Standing up: Left leg below knee, 26 cm.; left calf, 26 cm.; left ankle, 19 cm.

This shows no general increase in size on standing, although there was decided enlargement while the patient stood up in the nodular swellings described above The measurements show the left leg to be about 1 cm. larger than the right.

Diagnosis of varicose veins was made with possible foreign body at junction at arms of T-scar, probably buried suture from former operation.

Operation, Dr. Platt, July 5, 1905. Under ether the painful mass at intersection of lines of scar was explored, and a very dense mass of scar tissue found and excised, but there was no foreign body in it. Wound was closed. Later a blood-clot formed. Wound broke down, and healed by granulation without infection.

The patient was passed on to me when my summer service began at the Garrett Hospital, and an operation for the excision of the varicose veins was decided on.

Operation, August 2, 1905. Ether anæsthesia.

Long incision in front of tibia to outer side of ankle. Skin stripped back and many varicose veins excised including the swellings on the leg noted above, which were masses of dilated veins. The hard nodule in the lower one was a phlebolith and

grated under the knife. The mass in front of the ankle was under the fascia and not in the subcutaneous tissue as the others had been. It was bluish-purple in color and gave the impression of a cluster of enlarged veins shining through. On splitting the fascia the mass ballooned out into the wound, and when this opening was continued to the full length of the skin wound there was considerable bulging of similar tissue throughout. This bulging mass turned out to be the tibialis anticus, the extensor longus digitorum, extensor proprius hallucis, and peroneus tertius muscles, the fibers of which were replaced to a large extent by a network of coiled and tortuous blood-vessels, the largest being about the size of a lead pencil. (This is the only case on record in which these muscles are involved.) The vessel walls were quite thin and had the appearance of veins. The bundles of muscle fibers between which they ran in every direction seemed normal and in no way pale or fatty, but were quite scanty, in fact, it seemed that the muscular tissue was almost entirely replaced by the mass of vessels. There was little more adipose and connective tissue than would normally be seen. The tissue was soft, compressible and spongy. There was no pulsation, and no phleboliths were palpated. *This angiomatous condition was unsuspected up to the time when the fascia was opened.* The question of excision of involved muscles, or at least portions of them was considered, but as there had been no symptoms except the presence of external varicose veins, and as the muscles were functionating perfectly in spite of the great increase in vascular tissue it seemed best not to excise. The muscles were then separated from their attachments to the bone and surrounding tissues as far as possible, in the hope to produce scar tissue. No especial feeder was found running to the angiomatous mass. At this point the condition of the patient, who had not taken the anæsthetic at all well, became very bad, and rapid closure was necessary, so unfortunately a portion of the tissue was not excised for examination. I was unable to close the fascia until the leg was held upright and the muscles milked, after which the tissues rapidly resumed their normal size, and closure was easily made with interrupted silk sutures both in fascia and skin. Small gauze drain at lower angle of wound. Silver foil, gauze and pressure bandage. First dressing on third day. Drain and three lower stitches removed. All stitches removed on tenth day. Healing per primam in all but lower two inches where the skin edges had separated somewhat. This healed by granulation. Convalescence uninterrupted. Flannel bandage.

Discharged August 31, 1905, 29 days after operation.

Measurements.—Left leg below knee, 24.75 cm.; left calf, 25.25 cm.; left ankle, 18 cm. The leg is generally somewhat smaller as the measurements show. No enlarged veins are to be seen. There is, however, still under the lower widened portion of the scar the swelling in front of the outer malleolus.

After History.—The patient was seen in August, 1907, two years later. She says she is much improved in every way, and with the aid of a rubber stocking is able to get about without any discomfort. She has grown considerably since discharge. Examination shows the superficial veins are again prominent both on front and back of leg, and also in popliteal space. The lower portion of the scar has spread and is about 2 cm. wide. The mass under this spread portion of the scar is much smaller than when the patient left the hospital, and can scarcely be noticed. There is the sensation of the pricking of pins, and often there is jerking of the leg and much discomfort when the edges of the spread portion of scar are stroked with the finger, but this sensation passes off when pressure is applied. She complains of some discomfort after running or standing for a long time, in the outer posterior portion of lower third of thigh, extending down to the popliteal space. This area is slightly tender on palpation. Examination, otherwise negative. Veins of thigh are not enlarged. The left leg and thigh are smaller than the right, actual measurements showing 2.5 cm. difference. Both ankles measure the same. The difference in measurement is probably due to her saving the left leg somewhat. Motion of foot and leg is perfect. Except for a feeling of fullness and tingling when she walks without the stocking there is much improvement in the clinical condition, although the angiomatous growth itself is probably not materially modified. Gradual withdrawal of the stocking and massage advised. Further operative procedures to be considered later if necessary.

Historical.—The first case in the literature is that described by Liston in March, 1843, which he called an erectile tumor in the popliteal space, and which turned out to be an angioma of the semimembranosus muscle. In considering the subject in the following résumé I have taken up only those angiomata of the voluntary muscles, which develop in the muscle itself, and have not invaded the muscle secondarily from neighboring structures, such as the skin and subcutaneous tissues, as in the cases of Poland, La Morier, Cranwell, etc. Angiomata of the muscles of the tongue (except the case of Rigaud) and of the lips have been omitted as it is difficult to discover the primary origin in the majority of these cases. Lymphangiomata have also been omitted except where they occur with hemangiomata, as in the case of Monzardo, although it is claimed by some that all hemangiomata of muscle are primarily lymphangiomata, and that the blood secondarily enters the lymph lacunæ. The older writers on cavernous angioma of muscle always spoke of it as an erectile tumor, and often it has been compared with the erectile organs. The gross appearance of a cavernous angioma and true erectile tissue is undoubtedly quite similar, but as Rigaud remarks, the comparison cannot well be made when we consider that the variation in the volume in the true erectile tissue is due to the influence of vasomotor and sensory nerves, while variation in the size of an angioma is due simply to mechanical pressure of the blood. In other words, the erectility of an organ, such as the corpus cavernosum is an active erectility, while that of a cavernous angioma is a passive erectility.

Definition.—An angioma of the muscle is a tumor due to the proliferation of preexisting vessels in a certain district of the vascular network of the muscle, forming a simple angioma; or to proliferation, dilatation, and sometimes fusion of the vessels which transmit the blood from the arteries to the veins, forming the cavernous variety. Its origin is either congenital or traumatic, and its appearance when congenital may be favored by traumatism. As the disease progresses there are observed perithelial and endothelial proliferation with a cellular and fibrocellular connective-tissue production around the vessels, and an interstitial myositis with atrophy, and in some cases (Case II) a substitution of adipose tissue.

Etiology.—There is considerable difference of opinion as to the etiology of angiomata, and numerous theories have been advanced. Virchow says they are due to disease of the vasa-vasorum and dilatation of preexisting vessels; Rindfleich and Rokitanski that they develop separately from the circulatory system, and secondarily communicate with the vessels; Esmarch that proliferation of normal vascular walls cause angio-

mata; Honsell rather inclines to the idea of vascular fibromata; Monzardo that increase of vascular tension in the territory of the seat of the tumor is the pathogenic cause; Riethus that they are congenital anomalies, and Wardrop that they are always congenital anomalies. Sutter in his very comprehensive paper writes that angiomata of muscle are probably primarily congenital malformations in the vessels which may only be noticed in later years, and thinks that obstruction to drainage due to proliferation of the coats of the vessel walls and damming back of the flow in the interior of the tumor probably cause the formation of the venous and cavernous spaces. There are cases reported, however, which undoubtedly have followed trauma, as Cases III and V. The consensus of opinion seems to point first, to a congenital origin, in which class the majority of the tumors belong; second, to a traumatic origin with the possibility of both, that is, having an injury to a part in which the congenital anlage exists. It is thought that muscle angioma has its origin from a certain district of the vascular network of the muscle. However, there is no particular afferent or efferent vessel in the majority of cases, that of Fornari being the only one reported with a definite afferent vessel. It is also possible that friction, due to the location of the tumor, and the action of the voluntary muscle in which it is situated may have a part in the development. Angioma of muscle is independent of nævus of the skin. Most of the cases are in children or young adults, and are about equally divided as to sex.

Geographical Distribution.—It is not possible to point out any definite geographical distribution, although the literature shows most of the cases from Italy, France, and Germany. This, however, is probably due to the fact that more interest has been taken in this class of tumors in these countries, and, therefore, more cases have been reported. There have been comparatively few cases reported in the United States, those of Agnew, Bloodgood, Gross, Keen, Senn, Summers, and Thorne being the full list as far as could be found.

Personal history, social condition, occupation, and dietary influence add nothing of importance to the etiology.

Heredity.—Transmission of primary muscular angioma from parents to children, or the occurrence of this tumor in two children of the same family has never been recorded. Therefore, it seems that heredity also plays an unimportant part in the etiology.

Race.—All the cases reported are in the white race except those six published by Nagatomi, which were in Japanese. As the proportion of negroes to whites admitted to the hospitals in this section of the country is very much greater than further north, it is interesting to note that Cases I-VI inclusive, were all in whites.

Symptoms.—These clinical symptoms are based on the entire literature and on the cases reported here. There is no peculiarly definite symptom. The tumor is often noticed early in life, and is slow growing. "As a rule, it remains latent until causes of which at present we have no knowledge induce it to grow more rapidly."

There is pain in many cases, and this seems to be the most constant symptom (Cases I, II, III, IV, and V). It may be slight or very intense. It may be continuous or only appear on motion (Case V), and it may even occur periodically, as in Keller's case, where there was pain only in the spring and fall. The pain is probably due to pressure, as it would be difficult for the tumor to develop in a limited space without causing pressure on the nerve trunks. Tenderness on palpation is very marked in some instances (Case IV). There may be numbness of the extremity, followed by heat and burning, or occasionally the sensation of formication, tingling and fullness, as in case reported by Magon. Sometimes there is loss of function of the part involved. The symptoms may be so little pronounced that attention is drawn to the growth only by its size interfering with work or with the comfortable adjustment of garments. Occasionally the tumor is found at autopsy, no symptoms having been complained of during life. Sometimes the growth is discovered during an operation performed for the relief of some other trouble, as in Case IV, where the tumor was chanced upon during an operation for varicose veins. The cause of the varicose condition of the veins of the leg in a child of this age, 12 years, was discussed before operation, but no definite conclusion was reached in her case. It might, however, be well to bear in mind in future that varicose condition of veins of leg in children can be caused by an angioma of the muscle, and the tumor itself not be discoverable by swelling or any other symptom, and only demonstrable by operation.

Diagnosis.—The diagnosis until recently was seldom made before operation, the comparative rarity and depth of seat being the two principal reasons for this difficulty. Now, however, it is recognized more often. An angioma may be situated in any voluntary muscle. The skin over the tumor is usually normal and can be lifted in folds, but now and then it is adherent. The superficial veins are in some instances enlarged and tortuous, as in Cases IV and VI. Occasionally there is pulsation in a cavernous angioma in the early stage, as in Liston's case, and Matsuaka reports a case of pulsating cavernous angioma in the later stage. This pulsation may possibly be transmitted from a neighboring artery. There may be a souffle also, but these are very uncommon phenomena in connection with this tumor. The tumor is usually soft but it may be hard and elastic. It may be smooth or there may be lobulation. Its consistency to touch changes with contraction and relaxation of the muscle. It may be movable laterally when the muscle is not in a state of contraction. It is not as a rule sharply defined, and in some cases shows a tendency to spread. When diffuse it is difficult to make out the exact size by inspection or palpation. Some are completely reducible, as in Magon's case, some are partially reducible, Case III, and some cannot be reduced at all, as in Nagatomi's case. Compressibility has long been looked on as one of the most important points in diagnosis, although it cannot be absolutely depended upon. Change in position of the limb causes change in size of the tumor in many cases (Case I). An Esmarch bandage applied above often causes

diminution in size and sometimes complete disappearance of the tumor. The size of the tumor varies from that of a pea to that of a small pumpkin, but most of them are about the size of a pigeon's egg or smaller. Rigaud says that primary angiomata are always circumscribed, single and small, and secondary angiomata are always diffuse, multiple and large. These facts are not borne out by the statistics which follow. *Phleboliths* can often be palpated (Cases III, IV, and V), and on this account the X-ray has been used as an aid in diagnosis. In Mahar's case, however, the shadow of a "vein stone" was so close to the bone that a diagnosis of bone tumor was made. Sometimes areas of bone formation, so-called ossifying angiomata, and osseous lamina are found in angiomata of muscle, but these structures can probably be explained as exostoses, which invade the tumor, and in the struggle are cut off from the point of origin and absorbed. *Deformity*, as in Case II, due to angioma of muscle has of late received considerable attention, and in a paper by Putti on this subject he speaks of the deformity being used as an aid in diagnosing the obscure condition in certain cases. *Exploratory puncture* is used frequently as a means of diagnosis, and if normal blood is withdrawn, and the tumor rapidly regains its original size, it is evident that it is a vascular growth, and probably an angioma. There seems to be a moderate preference for the lower limb in the location of the tumor. Kuttner quotes Bayha and von Hippel as saying that congenital cavernous angiomata have been observed to increase in size at puberty; also Pitchler, who makes the very interesting statement that a cavernoma of the liver never occurs before puberty. We can realize the difficulty in making an accurate clinical diagnosis when we consider that the diagnoses mentioned below are some that have been made, before operation, of tumors turning out to be angiomata of muscle.

Differential Diagnosis.

Lipoma.—Angioma of muscle is most frequently diagnosed lipoma, and there are many points of similarity. A lipoma of muscle is as a rule soft and somewhat lobulated. It gives the impression of being slightly reducible. There is little pain either spontaneous or on palpation. It is slow growing. All of these characteristics may be found in muscle angiomata. However, we must remember the great rarity of a primary lipoma of muscle, and it has been said that when a primary intermuscular tumor is found it is best to systematically reject the diagnosis of lipoma.

Sarcoma.—Primary sarcoma of the muscle is exceedingly rare, so we must consider especially those sarcomata arising from the fascia between the muscle and skin, the connective tissue between the muscle bundles and from the tendon sheaths. The intermuscular sarcomata are hard to differentiate in their early stages from the benign connective tissue tumors, which may occur in the same region. The skin is usually normal. The growth is very rapid and often follows injury. The tumor is soft and occasionally seems to be slightly reducible, and also gives the impression of fluctuation. It is seldom encapsulated, but may be circumscribed. There is no difference in size with change of position. In all doubtful cases exploratory incision is imperative, and the naked eye appearance is characteristic of the various varieties, such as lymphangiosarcoma, endothelioma, hemangiosarcoma. Recovery from radical operation in these cases is rare, the patients dying within a comparatively short time of metastases, unless operated on very early, and the growth completely excised. The malignancy of spindle cell and round cell sarcomata varies with the number of round cells, and it is often very difficult to differentiate a sarcoma from a fibroma.

Hemangiomatous Elephantiasis.—The skin is normal. The tumor is slow-growing, firm, lobulated, compressible in places, usually circumscribed. If the limb is elevated for some time the tumor becomes somewhat smaller; if lowered, it becomes harder and more tense. To the naked eye the growth shows brownish-red spongy tissue in certain areas, surrounded by dense fibrous tissue. Microscopically we get the picture of a fibrous and lymphatic elephantiasis with angiomatous areas. In the cases described all of the tumor could not be removed without amputation of the limb. There have been no recurrences and no metastases.

Syphiloma of Muscle.—This is common, and many of the cases formerly diagnosed sarcomata were gummata. They may be single or multiple. It occurs late in the disease. Pain and tenderness are sometimes present. It is movable at first, but may adhere to the skin and ulcerate later. A definite specific history and disappearance of the tumor under proper treatment will aid in differentiation. An exploratory incision will show a characteristic, firm, central necrotic area with zone of infiltrated muscle outside of this.

Chronic Myositis.—The differentiation clinically from innocent and malignant tumors is difficult. It is a chronic inflammatory infiltration, and degeneration, secondary to traumatism or long-continued pressure. The skin may be adherent and indurated. There is local pain and tenderness, and the swelling is hard and more or less diffuse. The X-ray shows a shadow more dense than that of the normal muscle. There is no bony change. An exploratory incision shows that the muscle bundles are firmer and paler. The intermuscular connective tissue is increased. There are muscle bundles between masses of young cellular or old fibrous connective tissue. It does not appear like a new growth. Microscopically there is great increase in the fibrous connective tissue, and atrophy and beginning degeneration of the muscle bundles. Trichinosis can be excluded.

Tuberculous Myositis.—This may occur in any muscle. As a rule there is no pain or tenderness with the swelling, and it cannot be distinguished from other forms of myositis. An abscess often follows this condition. The diagnosis is sometimes difficult if there is a deep-seated cold abscess; careful examination, however, may disclose a focus of disease in a bone or neighboring joint from which it comes. In tuberculous myositis an exploratory puncture will show thin serous fluid with caseous detritus, and this was formerly the only

sure way of making a diagnosis without incision. Now the tuberculin test may be utilized as an aid in diagnosis in both of the conditions just mentioned.

Primary Myositis Ossificans.—It is caused by trauma either slight and frequent, or single and severe. There is a question as to whether the ossification arises from the connective tissue cells, as claimed by Vulpius, or from strips of periosteum detached by the trauma, such as Berndt has demonstrated. The latter view seems the most probable. The growth appears as a rule at particular points in the muscular system, as in the adductor longus of the thigh in horseback riders, called "rider's bone," and in the pectoralis major in soldiers, called "the drilling bone," both being due to constant slight injuries. It is hard and bony; the skin is normal. The tumor may or may not be adherent to the bone. It is not compressible. Sometimes there is a soft crepitation. The X-ray is of great aid in diagnosis.

Fibroma of Muscle.—This is not common. Several cases have been reported in the abdominal muscles following pregnancy in the female, and trauma in the male. It is hard, never fluctuates, and as a rule its boundaries are well defined. The growth is quite rapid.

Hernia of Muscle.—There are two general varieties—true and traumatic. The true muscle hernia is very rare. It develops insidiously and is easily seen when the muscle is at rest. It disappears entirely when the muscle is passively stretched, and also when the muscle is contracted with resistance. The traumatic variety always follows injury. It appears suddenly and is a soft tumor. It feels elastic during moderate contraction, and hardens during full contraction. It subsides entirely during relaxation. The vent in the fascia can be felt in some instances. From the above characteristics it is not a difficult matter to differentiate either the true or traumatic hernia from an angioma of muscle. In lacerated wounds of the skin and muscle the œdematous granulation tissue thrown out by the muscle is unusually vascular, and might suggest a previous angioma.

Hematoma.—Although it seems that the sign of hematoma is quite characteristic, nevertheless an angioma of muscle has been mistaken for it. It is due to a rupture of intramuscular vessels following trauma. It is especially common in the abdominal muscles as well as in the superficial muscles of the body and limbs. The tumor appears shortly after injury, and fluctuates but is not reducible. At first, exploratory puncture shows very dark blood, but later when coagulation has taken place only serum may be withdrawn. In the walls of an old hematoma calcification may take place, and then it is difficult to distinguish it from a fibroma or an osteoma.

Hydatid Cysts of Muscle.—These have been diagnosed before operation in a very few cases, but must always be thought of. The tumor is round or fusiform, may fluctuate or be elastic to touch. It is painless and develops slowly. They have no particular location, and no constitutional symptoms. An exploratory puncture will show a perfectly clear fluid, in which sometimes one can find the characteristic hooklets with the aid of the microscope.

Dermoid Cysts.—These never occur in the muscles of the extremities, but they are sometimes found in the jaw under the muscles.

Primary Carcinoma of Muscle.—It has never been found. A metastatic muscle carcinoma is almost unique, except in the pectoral muscle secondary to breast carcinoma, or in the abdominal wall following carcinoma of the stomach.

Sometimes, however, it is necessary even after excision, in small atypical angiomata, to examine the growth microscopically in order to decide absolutely on its character.

Pathology.—Angiomata of muscle are divided into two general classes:

Simple or Teleangiectatic	Capillary, Venous, Arterial	Rare	Circumscribed	Rare
			or	
Cavernous	—	More frequent	Diffuse	Common

We find often, however, all the divisions of the simple variety in addition to the cavernous in different portions of the same tumor.

On section the tissue is red or brownish-red, and gives the impression of a blood-filled sponge. It has also been compared in gross appearance to placental and splenic tissue. It is more or less compressible. One can see spaces filled with blood and surrounded by connective tissue, which is loose-meshed in some places, and dense in others; the muscle bundles remain unchanged, or are seen in various stages of degeneration between which the angiomatous tissue infiltrates: the intermuscular fibrous tissue is increased; there are islands of fat; the mouths of the dilated vessels gape; and spongy angiomatous tissue is found. In some cases there is practically nothing but a mass of thin-walled veins (Case VI)! in others there is considerable increase in adipose tissue (Case II); and on the other hand, in others the connective tissue is most marked. The tendons and nerve trunks are rarely affected, and large arteries are usually normal. The striated muscle in which the tumor forms has apparently a perfectly passive rôle.

With higher magnification the following changes in the tissues mentioned are noted:

Striated Muscle Tissue.—It is unaffected where the connective tissue growth is slight, but where it is plentiful we find all stages of metamorphosis (Case IV). The muscle bundles atrophy as the connective and the angiomatous tissue augment, the degeneration being due to pressure and lack of nourishment. A few included striated fibers are occasionally found in the depth of a diffuse tumor. The muscle fibers simply have the relation of contiguity with the circumscribed angioma which grows between the fibers, and pushes them aside, never including any of them in its depths.

Smooth Muscle.—It predominates in some places and seems to originate from the proliferation of the muscular coats of the vessels, from arterioles and veins respectively, according to some authors, but probably from both (Case IV).

The Connective or Fibrous Tissue.—This originates from the perimysium (Muscatello), or from the adventitia of the

arterioles and veins (Reclus and Magitot), and forms the framework of the angioma. It is found in all stages of development, and may be diffuse or scanty. It may condense at the periphery and form a capsule. Karyokinesis is occasionally seen in the nuclei of the connective tissue cells.

Adipose Tissue.—It is more or less abundant among the connective tissue meshes and between the muscle fibers, and is not a special element of the new formation, but is simply tissue replacing destroyed muscle. It is a well known pathological fact that when any highly specialized tissue is destroyed, adipose tissue usually replaces it.

Elastic Tissue.—By proper staining this is seen to run everywhere throughout the tumor.

Nerve Filaments.—Both these in the muscle, and occasionally nerve trunks become included in the tumor, more often than microscopic examinations seem to show, and this probably accounts for the pain and trophic disturbances, which are present in so many angiomata of muscle. The nerve fibers resist degeneration better than the muscle fibers, and seldom appear much involved.

There may be found in the same tumor a simple and a cavernous portion, but an angioma may be purely simple or purely cavernous. Reclus and Magitot say, however, that it is easy to trace the changes from the simple to the cavernous variety; Rigaud that the growth always begins with a simple angioma, and that the cavernous variety is a later and exaggerated form of the simple variety, and if the angioma ever reaches the cavernous stage it never recedes; Mauclaire and Bovis that the capillaries are formed first, then the veins and arteries. The changes in the vessels are generally as follows, and as a rule the vessels and cavernous spaces contain normal blood.

Capillaries.—They are most important. They proliferate and buds are sometimes seen coming from the walls and karyokinetic figures in the nuclei of the endothelium (Muscatello). Each capillary has a wall of its own and the lumen varies in size. Instead of a single layer of endothelium there may be two or three. The capillaries finally dilate, fuse, and form the cavernous spaces (Sutter). Rigaud says, however, that the number of capillaries always remains the same, and that there is never any fusion of two or more capillaries to form lacunæ, but the lacunæ are due entirely to dilatation.

Veins.—New vessels are formed with the structure of veins. the walls may be thickened, or dilated and atrophied. The lumen is sometimes normal, but often is irregular. The dilated vessel may form the irregular venous space cavities, which are probably the result of obstruction (Sutter). Thrombi in all stages of organization and phleboliths can be found in many of the tumors both in the varicose veins and in the lacunæ. There is some difference of opinion as to the origin of phleboliths. Rokitanski believed they were calcified blood coagulations, and this theory might also be adopted for their formation in an angioma of muscle; Cornil, that phleboliths existing in angiomata have the same origin as those found in veins, and that they are derived like those from fibrous products that come from the vessel wall and then undergo calcareous infiltration. Bajardi thinks that phleboliths occur in the lacunæ and also probably more frequently in the dilated varicose vessels existing here and there in the tumor. This idea is probably correct. In both situations it is preceded by a thrombus and its successive organizations (Cases IV and V).

Arteries.—Many of the small arteries show either eccentric or concentric thickening of the walls, with increase in smooth muscle fibers. The lumen is normal or somewhat smaller, and the endothelial lining is thickened.

Cavernous Angiomata.—They are the most common and have the characteristic lacunæ, which are formed in most instances by the dilatation and fusion of the capillaries. The lacunæ vary in size, are lined by endothelium, and contain normal blood. There is said to be no endothelial lining to some of these spaces, and the blood is in direct contact with the connective tissue and smooth muscle surrounding them. Around the spaces is a framework of connective tissue and smooth muscle carrying arteries and veins. The spaces are subdivided by connective tissue partitions, which are thick if the connective tissue is abundant, and thin if it is scanty. The partitions are covered with endothelium, and some are so thin as to bring endothelium back to back. In places the partitions do not reach across the spaces and give the appearance of valves. These formations seem to depend on the proliferation of the connective tissue and not on atrophy of preexisting tissue due to pressure of the blood. In Case I we find in the center of the tumor a large cystlike cavity filled with blood. This cavity is very much larger than any ordinary lacunary space, and is probably due to the breaking down of the walls between these spaces by the pressure of hæmorrhage due to injury to the tumor. There may be collections of leucocytes in the connective tissue, which resemble lymph follicles, or marked round cell infiltration and considerable collection of connective tissue nuclei with very little intercellular substance, both of which suggest sarcoma.

Dr. Cushing tells me that he has never had a case of primary muscle angioma in the Hunterian Laboratory of the Johns Hopkins Medical School, and the only mention I can find in the literature, of angioma in animals was of Petit and Pagnon, who describe multiple subcutaneous cavernous angiomata in a dog.

Rau reports a case found at autopsy of cavernous angioma the size of a cherry in the wall of the right auricle in a man 52 years old.

Prognosis.—The majority of angiomata of muscle are benign, but we find sometimes with the microscope a round or spindle cell infiltration, which points towards malignancy. However, there is a tendency for the angioma to invade the surrounding tissues in some instances, as noted by Putti, and possibly to metastasize to other portions of the body, but this latter is very doubtful. There have been local recurrences after excision in several cases of the diffuse variety, probably because all of the tumor substance was not removed, but this is rare. Partial excision, on the other hand, has effected perfect cure in many other cases (Cases II and III). The

Author.	Reference.	Age.	Sex.	Duration.	Location.	Treatment.	Result.	Remarks.
Agnew.....	Agnew's Surgery, 1883, Vol. III, p. 389.	(?)	F.	Congenital.	Abdominal muscles.	Excision.	Recovery.	
Alessandri....	Policlinico, Roma, 1904, XI, p. 117.	29	F.	4 yrs. Rapid growth 2 mos.	Trapezius.	....do.	....do.	Cavernous angioma. Pain. Fluctuation.
Allier.....	Cit. by Coletti.	(?)	(?)	....(?)	Pectoralis major.	....(?)	....(?)	
Anziolotti.....	La Clinica Moderna, 1903, p. 508.	29	M.	About 3 yrs.	Orbicularis palpebrarum.	Excision.	Recovery.	Arterial angioma. Circumscribed. Pain.
Auvray.....	Tribune Méd. Par. 1905, XXXVII, 21.	20	F.	2 yrs.	Vastus internus.	....do.	....do.	Capillary angioma. Pain. Diagnosed arthritis.
Bajardi.....	Clin. Med. Pisa, 1900. VI. 339.	12	M.	More than 1 year.	Gluteus medius.	....do.	....do.	Cavernous angioma. Circumscribed. Pain. Diagnosed false neuroma.
Do.....	.....do.....	10	F.	Congenital.	Masseter.	....do.	....do.	Cavernous angioma. Diffuse. No pain. Phleboliths.
Do.....	....do	Young	F.	2 yrs.	6th intercostal.	... do	....do.	Cavernous angioma. Diffuse. Pain. Diagnosed costal caries. Endothelium of capillaries continuous with that of cavernous spaces.
Do.....	.....do	22	F.	12 yrs.	Flexor longus digitorum (foot).	....do.	....do.	Arterial, capillary and cavernous angioma. Pain. Posterior tibial artery and nerve involved by the tumor. Osseous lamina not connected with tibia.
Bayha.....	Deutsche Zeitsch. für Chir. Vol. LI, p. 200.	25	F.	10 yrs.	Triceps muscle.	....do.	....do.	Capillary venous angioma.
Do.....	.....do.....	17	M.	3 yrs.	Trapezius and latissimus dorsi.	....do	....do.	Capillary venous angioma.
Do...	.....do.....	5	(?)	2 yrs.	Supinator longus.	....do.	....do.	Cavernous angioma. Phleboliths.
Do.....	.....do.....	18	(?)	Congenital.	Vastus externus.	....do.	....do.	Cavernous angioma.
Bellouard.....	Cit. by Rigaud, Thèse de Paris. 1903.	(?)	(?)	....do	Sacro-lumbar muscles.	...(?)	.. (?)	
Berard..... ..	Cit. by Sutter.	(?)	(?)	....do	Vastus externus muscle.	....(?)	....(?)	
Berger.....	Cit. by Rigaud, Thèse de Paris, 1903.	(?)	(?)	....do	Back muscles.	Excision.	Recovery.	Cavernous angioma.
Do.....	.....do.....	(?)	(?)	....do.	Flexor carpi ulnaris.	....do.	....do.	Cavernous angioma. Phleboliths.
Biblioth	Cit. by Rigaud, Thèse de Paris, 1903.	(?)	(?)	....(?)	Trapezius.	....(?)	....(?)	
Bichat.....	Cit. by Alessandri.	(?)	(?)	....(?)	Triceps.	....(?)	....(?)	
Boekel.....	Cit. by Rigaud.	(?)	(?)	5 yrs.	Quadriceps femoris.	....(?)	....(?)	
Bonnet.....	Thèse de Toulouse, 1894.	24	M.	1 yr.	Vastus internus.	Excision.	Recovery.	Simple angioma.
Bossalino.....	Cit. by Alessandri.	17	M.	5 yrs.	Right rectus of eye.	....do.	....do.	Cavernous angioma. Circumscribed.
Billroth.	Virchow's Archiv, VIII, 264.	(?)	(?)	....(?)	Latissimus dorsi, deltoid.	....do.	....do.	Cavernous angioma.
Le Gros Clark.	Cit. by Sutter.	(?)	(?)	....(?)	Latissimus dorsi.	....(?)	....(?)	
Coletti..	Riforma Med. Napoli, 1906, XXII, 290.	5	F.	Congenital.	Trapezius.	Excision.	Recovery.	Cavernous angioma, also subcutaneous angioma of arm. No pain. Skin normal.
H. Coote.....	London Med. Gaz. 1852, p. 412.	(?)	F.	Congenital.	Deltoid.	....do.	....do.	Simple venous angioma.
Corneloup....	Lyon Méd. 1904, CII, 969.	38	M.	Post-traumatic 20 yrs.	Vastus internus.	....do.	....do.	Cavernous angioma. Diffuse. No pain.
Cruveilhier...	Cit. by Coletti.	(?)	F.	....(?)	Biceps, coracobrachialis, brachialis anticus, pectoralis, major.	....(?)	....(?)	Cavernous angioma. Found at autopsy.
Delegenière..	Cit. by Alessandri.	(?)	(?)	....(?)	Flexors of forearm.	....(?)	....(?)	
Demarquay...	Union Médicale 1861.	28	F.	9 yrs.	Supinator longus.	Excision.	Recovery.	Cavernous angioma. Pain. Encapsulated. Unable to extend arm. Diagnosed neuroma of radial.
Do..... ...	.....do.	(?)	(?)	...(?)	Flexor sublimis and profundus digitorum.	....do	....do.	Erectile tissue.
Do....	Dictionnaire Decham-bre. Cit. by Sutter.	29	M.	....(?)...	Semimembranosus.	....do.	....do.	
Denonvilliers	Union Médicale 1861.	(?)	(?)	....(?)	Rectus femoris.	....(?)	... (?)	Cavernous angioma.
Donati.....	Archivo per le Scienze Med. Vol. XXX, No. 26, p. 502.	25	F.	3-4 yrs.	Soleus.	Excision.	Recovery.	Cavernous angioma. Diffuse. Pain. Loss of function of leg.
Eve	Brit. Med. Jour., 1901, No. I, 1143.	15	F.	4 yrs.	Vastus internus and synovial membrane of knee-joint.	....do.	....do.	Cavernous angioma. Pain. Swelling.

Author.	Reference.	Age.	Sex.	Duration.	Location.	Treatment.	Result.	Remarks.
Eve.....	Brit. Med. Jour., 1901, No. I, 1143.	Young	F.	...(?)	Knee-joint and surrounding muscles.	Excision.	Recovery.	Cavernous angioma. Diffuse.
Do.....	..... do.	24	M.	3 mos.	Triceps, anconeus, and synovial membrane.	....do.	....do.	Angioma with much fat.
Do..... (Discussion).	Cit. by Kolaczek.	(?)	(?)	....(?)	Gracilis.	....do.	....do.	Muscle angioma.
Do..... (Discussion).	.....do.....	(?)	(?)	....(?)	Flexors of forearm.	....do.	....do.	Muscle angioma.
Fritsche.....	Cit. by Sutter.	9	F.	Post-traumatic 1½ yrs.	Semimembranosus and tendinosus.	...do.	....do.	Cavernous angioma. Size of small pumpkin. Encapsulated. No pain. Diagnosed abscess.
Fonari.....	Raccoglita Med. Forli, 1894, IV. s. XXI., 433.	12	M.	Congenital.	Sartorius.	....do.	....do.	Cavernous angioma. Speaks of afferent artery.
Furlkröger...	Cit. by Kolaczek.	23	M.	Congenital.	Short muscles sole of foot.	....do.	....do.	Diffuse cavernous angioma.
Germe.... ...	Thèse de Paris, 1900, Case of Tilloux.	20	F.	Congenital 18 yrs.	Teres major.	....do.	....do.	Cavernous angioma. Pain.
Do.....	Thèse de Paris, 1900, Case of Reclus.	35	M.	Post-traumatic 16 yrs.	Latissimus dorsi, teres major.	....do.	....do	Cavernous angioma. Lately pain and rapid growth. Diagnosed sarcoma-hematode.
Gross.....	System of Surgery, Vol. I., 617.	(?)	F.	... (?)	Deltoid.	...do.	....do.	
Gussenbauer.	Cit. by Alessandri.	(?)	(?)	....(?)	Quadriceps extensor.	....(?)	....(?)	
Do.....	.....do.	(?)	(?)	....(?)	Abdominal muscles.	....(?)	....(?)	
Do.....	.....do.	(?)	(?)	....(?)	Quadriceps extensor.	....(?)	....(?)	
Hardouin.....	Bull. et Mém. Soc. Anat. de Paris, 1905, LXXX, 261.	23	M.	3½ yrs.	Quadriceps femoris.	Excision.	Recovery.	Cavernous angioma. Diffuse. Pain. Healed by granulation. Diagnosed tuberculosis.
Heide.....	Arch. f. klin. Chir. Vol. LXXX, part 3.	12	M.	Congenital.	Lower extremity.	Electrolysis.	Improvement.	Cavernous angioma. Diffuse. Compressible. Phleboliths. Skin involved.
Heinlein.....	System of Pract. Surg. von Bergman, Vol. III, 145.	(?)	(?)	.. .(?)	Upper arm.	Excision.	Recovery.	Cavernous angioma. Subfascial, intermuscular. The size of a goose egg.
Henoque.....	Cit. by Coletti.	(?)	(?)	....(?)	Soleus.	....(?)	....(?)	
Honsell.....	Beiträge zur klin. Chir. 1902 No. 32, p. 259.	21	F.	6 yrs.	Entire biceps femoris, semimembranosus and tendinosus.	Partial excision.	Recovery.	Cavernous angioma. Two lobes. Pain.
Hulke...	Cit. by Alessandri.	(?)	(?)	....(?)	Trapezius.	....(?)	....(?)	
Karewski.....	Cit. by Alessandri.	(?)	(?)	....(?)	Deep neck muscles.	....(?)	....(?)	
Do.....	.....do.	(?)	..do.	....do.	Trapezius.	....(?)	....(?)	
Keen.....	Annals of Surg. 1905, II, p. 393.	12	M.	Post-traumatic 7 yrs.	Extensor brevis pollicis, flexor longus pollicis (foot).	Excision.	Recovery.	Cavernous angioma. Pain.
Keller.....	Deutsche Zeitsch. für Chir. 1904, LXXIV, p. 574.	24	F.	Congenital.	Biceps femoris, semimembranosus.	....do.	....do.	Cavernous angioma. Loss of function. Pain. Post-operative infection.
Do.....	.....do.	20	F.	....(?)	Deep back muscles.	....do.	....do.	Cavernous angioma. Phleboliths.
Kirmisson....	Bull. et Mém. Soc. de Chir. de Paris, 1905, XXXI, p. 19.	14	F.	....(?).....	Crural triceps.	....do.	....do.	Cavernous calcified angioma. Pain. X-Ray in diagnosis of.
Kolaczek.....	Beiträge z. Klin. Chir. Vol. LVI, 2, p. 448.	13	F.	3 yrs.	Biceps brachii.	....do.	....do.	Cavernous angioma. Encapsulated. Pain. Bony spicule.
Do.....	.....do.	16	M.	3 mos.	Biceps femoris.	....do.	...do.	Simple angioma. Diffuse. Pain.
Do.....	.....do.	47	F.	7 mos.	Rhomboideus.	....do.	....do.	Cavernous angioma. Pain.
Do...	. .....do.	21	M.	5 yrs.	Masseter.	....do.	....do.	Cavernous angioma. Pain. Somewhat circumscribed.
Do.....	.....do.	23	F.	9 yrs.	Biceps femoris, vastus externus, gastrocnemius and soleus.	....do.	....do.	Cavernous angioma. Diffuse. Skin involved. Enlarged superficial veins. Pain. Phleboliths.
Lebert.....	Traité d'Anatom. Path. General et Special, 1857, I, 210.	(?)	(?)	...(?)	Triceps (arm).	....do.	...do.	Capillary and cavernous angioma.
Le Dentu.....	Études de Clin. Chir., Par. 1895.	9	F.	....(?)	Soleus.	....do.	....do.	Cavernous angioma. Compression of posterior tibial nerve. Pain. Diagnosed neuroma.
Lichtenaur...	Cit. by Kolaczek.	(?)	M.	....(?)	Semimembranosus, gastrocnemius.	....do.	....do.	Multiple primary muscle angioma.
Liston.....	Med. Chir. Trans. Vol. XXVI, 1823.	10	M.	Congenital 8 yrs.	Semimembranosus.	....do.	...do.	Cavernous angioma. Circumscribed. Pulsation in early stage. Pain.
Do.....	.....do.	40	M.	4 yrs.	Sterno-cleido-mastoid.	....do.	....do.	Erectile. Size of turnip.

Author.	Reference.	Age.	Sex.	Duration.	Location.	Treatment.	Result.	Remarks.
Lueke.....	Cit. by Alessandri.	(?)	(?)	...(?)	Trapezius.	....(?)	....(?)	
Magon	Bull. Soc. Anat. 1875.	(?)	(?)	....(?)	Superficial flexors (forearm).	Excision.	Recovery.	Cavernous angioma. Completely reducible. Pain. Phleboliths.
Mahar.....	Bull. et Mém. Soc. Anat. de Paris, 1904, LXXXI.	42	F.	10 yrs.	Pronator quadratus.	....do.	....do.	Cavernous angioma. Pain. Formication and numbness. Diagnosed bone tumor by X-Ray. Phleboliths.
Maisonneuve.	Union Méd. 1861.	(?)	(?)	....(?)	Deep neck muscles.	... (?)	. (?)	
Margarucci...	Anno. Per. I, LXXV, v. Insegn. Chir. di F. Durante. Univ. di Roma, 1898, III, 351.	26	M.	Post-traumatic.	Gastrocnemius.	Excision.	Recovery.	Cavernous angioma. Centres of ossification.
Do.....	Cit. by Alessandri.	20	M.	....(?)	Rectus abdominis.	....do.	....do.	Cavernousangioma. Compressible.
Mazzoni.....	Cit. by Alessandri.	(?)	(?)	....(?)	Triceps brachialis.	...(?)	....(?)	
Mendelsson...	Cit. by Kolaczek.	2	M.	Congenital.	Triceps brachii.	Excision.	Recovery.	Cavernous angioma.
Meyer.....	Inaug. Dissert. Berlin, 1898, Cit.by Alessandri.	19	M.	Sometime.	Triceps brachialis.	....do.	....do.	Cavernous angioma. Diffuse.
Do.....	.....do.	33	F.	Congenital.	Flexors of the forearm.	....do.	....do.	Spongy tumor. Diffuse. Phlebolith.
Monzardo.....	Riv. Veneta de Sc. Med. Venezia, 1903, p. 542.	18	F.	Congenital.	Quadriceps femoris.	....do.	....do.	Cavernousangioma. Diffuse. Slight pain. Lymph lacunae present in some places.
C. de Morgan.	Brit. and For. Med. Review, 1864.	10	F.	Congenital.	Gastrocnemius.	....do.	....(?).....	Cavernous angioma. Pain.
Do.....	.....do.	Mid. age.	F.	..(?)	Rectus femoris.	....do.	....(?).....	Cavernous angioma. Circumscribed.
Muscatello....	Riv. Veneta de Sc. Med. Venezia, 1894, XX.	9	F.	A few mos.	Trapezius.	....do.	....(?).....	Simple capillary angioma. Diffuse. Many new formed vessels. Karyokinesis in endothelial cells.
Do.....	.....do.	18	F.	Congenital.	Quadriceps femoris.	....do.	....do.	Arterial angioma.
Do.....	..... do.	28	M.	5 yrs.	Serratus magnus.	....do.	....do.	Cavernous angioma. Phleboliths.
Nagatomi.....	Mitt. de. Med. Gesellsch. zu Tokio, 1905, XIX. 1055.	27	M.	5 yrs.	Gastrocnemius.	....do.	....do.	Cavernous and venous angioma. Diffuse. Pain. Partially reducible. Skin normal.
Do..... ..	Do. (Case of Miyaki.)	9	F.	3 yrs.	Gastrocnemius.	....do.	....do.	Cavernousangioma. Diffuse. Pain. Pes equinus. Nerve trunks involved. Diagnosed gumma, then neuroma, then angioma.
Do.....	Do. (Case of Matsuaka).	40	M.	1 yr.	Gluteal muscles.	....do.	....do.	Cavernous angioma. Diffuse. Pain. Pulsation, (late stage). Compressible.
Do..	Do. (Case of Murata).	23	M.	3 yrs.	Sacro-lumbar muscles.	... do.	....do.	Cavernous angioma. Diffuse. Pain. Size of child's head.
Do.....	Do. (Case of Hida).	(?)	(?)	....(?)		....do.	... do.	Cavernous angioma. Diffuse. Vein stone.
Do.....	Mitt. d. Med. Gesellsch. zu Tokio, 1906, 373.	9	M.	Congenital.	Masseter.	....do.	....do.	Cavernous angioma. Pain. Not compressible. Present at birth. Disappeared and returned 6 years ago.
Nast-Kolb....	Beiträge zur klin. Chir. No. 55, 542.	12	F.	9½ yrs.	Leg muscles.	Amputation.	....do.	Cavernous angioma. Diffuse. Pain. Not compressible. Pes equinus. Enlarged veins. Posterior tibial nerve involved.
Nelaton and Tillaux.	Bull. Soc. Anat. 1861, p. 10.	Young	F.	....(?)	Pronator radii teres.	....(?)	....(?).....	
Ollier	Cit. by Rigaud.	(?)	(?)	....(?)	Pectoralis major.	....(?)	....(?).....	
Pantaleoni ...	Bull. delle Sc. Med. Chir. di Bologna, 1904, s. 8, IV, 442.	25	F.	11 yrs.	Masseter musele.	Excision.	Recovery.	Cavernous angioma. No pain. Diagnosed tubercuious gland.
Do.....	Cit. by Kolaczek.	8	F.	3 yrs.	Masseter.	....do.	....do.	Primary muscle angioma.
Pean.....	Leçons de Clin. Chir. Paris, 1876, p. 544.	21	(?)	2 yrs.	Masseter.	....do.	...do.	Cavernous angioma. No pain. circumscribed.
Petersen.....	Inaug. dis. Kiel, 1894.	11	F.	4 yrs.	Quadriceps extensor.	....do.	....do.	Cavernous angioma. Phleboliths.
Do...	.....do.	7	M.	5 yrs.	Calf muscles.	...do.	....do.	Cavernous angioma. Diffuse.
Pilzer.	Virchow's Archiv. No. 165, p. 427.	14	M.	.. .(?)	Muscles of leg and thigh.	Partial excision.	....do.	Cavernous angioma. Diffuse. Pain. Nerve trunk involved. Tiersch graft.
Pupovac.....	Archiv. f. klin. Chir. 1897, No. 54, 555.	15	M.	5 yrs.	Thigh muscles.	Excision.	....do.	Cavernous angioma.
Pupovac.....	.....do.	14	F.	6 yrs.	Quadriceps femoris.	....do.	....do.	Cavernous angioma.
Do....	.....do.	17	F.	Cougenital.	Abdominal muscles.	....do.	....do.	Cavernous angioma.

Author.	Reference.	Age.	Sex.	Duration.	Location.	Treatment.	Result.	Remarks.
Putti	Archiv f. klin. Chir. No. 79, 1906, p. 1031.	33	M.	(?)	Gastrocnemius.	Excision.	Recovery.	Cavernous angioma. Pain. Deformity (equinovarus). Diagnosed neuro-fibroma.
Do.	do.	29	M.	Post-traumatic, 19 yrs.	Gluteus maximus.	do.	do.	Cavernous angioma. Pain. Varicose veins. Pes equinus.
Quenu	Cit. by Alessandri.	(?)	(?)	(?)	Pectoralis major.	(?)	(?)	
Reboul	Congres. Assoc. Franc. St. Etienne, 1897.	(?)	(?)	(?)	Thenar eminence.	(?)	(?)	
Reclus and Magitot.	Rev. d. Chir. 1906, XXX, p. 709.	17	F.	Congenital.	Shoulder muscles.	Excision.	Recovery.	Cavernous angioma. Pain. Diagnosed sarcoma.
Do.	do.	28	F.	3 yrs.	Epitrochlear muscles.	do.	do.	Cavernous angioma. Pain. Phlebolith.
Richet	Cit. by Alessandri.	(?)	(?)	(?)	Triceps brachialis.	do.	(?)	Cavernous angioma.
Riethus	Beiträge zur klin. Chir., 1904, No. 42, p. 454.	14	F.	Post-traumatic, 4 yrs.	Tibialis posticus, flexor longus digitorum, flexor longus hallucis, plantaris.	Partial excision.	No improvement.	Cavernous angioma. Diffuse. Pain. Posterior tibial nerve involved. Amputation, 8 mos. later.
Do.	do.	32	M.	8 yrs.	Sacro-spinal muscles.	Excision.	Recovery.	Cavernous angioma. Pain.
Rigaud	Thèse de Paris 1903.	45	F.	(?)	Tongue muscles.	do.	do.	Cavernous angioma. Compressible.
Do.	do.	(?)	(?)	(?)	Muscles of forearm.	do.	do.	Cavernous angioma.
Do.	do.	(?)	(?)	(?)	Dorsal muscles.	do.	do.	Cavernous angioma.
Ritschl	Beiträge zur klin. Chir., 1895, No. 15, p. 99.	(?)	(?	(?)	Flexors of forearm.	(?)	(?)	
Do.	do.	(?)	(?)	(?)	Vastus internus.	(?)	(?)	
Roberts	Cit. by Kolaczek.	17	F.	(?)	Quadriceps.	Excision.	Recovery.	Cavernous angioma.
Robin	Gaz. Méd. de Paris. 1854, p. 348.	(?)	(?)	(?)	Vastus internus.	do.	do.	Cavernous angioma.
Rocher and Lafon.	Journal de Médicine de Bordeaux, Jan. '07, XXXVII, p. 42.	52	M.	Post-traumatic, 32 yrs.	Orbicular muscle of eye.	do.	do.	Cavernous angioma. Circumscribed. Pain. Diagnosed dermoid cyst.
Rosciano	Klin. Chir. Milano, 1904, p. 900.	22	M.	Congenital.	Rectus abdominis.	do.	do.	Cavernous angioma. Diagnosed lipoma.
Senn	Path. and Surg. Treat. of Tumors, 1900, p. 463.	16	M.	Post-traumatic, 5 yrs.	Quadriceps femoris.	do.	do.	Disappeared with elevation of limb.
Shaw	Cit. by de Morgan.	17	F.	Congenital.	Latissimus dorsi serratus magnus.	do.	do.	Cavernous angioma. Circumscribed. No pain.
Steele	Brit. Med. Jour., 1898, p. 432.	4	M.	Congenital.	Quadriceps femoris.	do.	do.	Cavernous angioma.
Stonham	Bland Sutton's Tumors, 4th Ed.	(?)	(?)	(?)	Gracilis	do.	do.	Cavernous angioma.
Strauch	Deutsche Zeitsch. f. Chir., 1902, No. 62, p. 323.	19	M.	15 yrs.	Masseter muscle.	do.	do.	Cavernous angioma. Slight pain.
Summers	Surg. Gynec. and Obstet. Chicago, 1906, II, 306.	33	M.	Post-traumatic, 8 yrs.	Gluteus maximus.	do.	do.	Cavernous angioma. No pain.
Sutter	Deutsche Zeitsch. f. Chir., 1905. No. 77, p. 368. Case of Policlinic at Berne.	2½	M.	Congenital.	Thenar muscles.	do.	Recurrence later.	Simple angioma. Recovery after second operation.
Do.	Do. (Case of de Quervain).	20	F.	11 yrs.	Soleus.	do.	Recovery.	Cavernous angioma. Diffuse. Pain.
Do.	Do. (Case of de Quervain).	12	M.	3 yrs.	Vastus internus.	do.	do.	Cavernous angioma. Diffuse.
Do.	Do. (Case of de Quervain).	28	M.	Congenital.	Supinator longus.	do.	do.	Cavernous angioma. Pain. Limitation of motion.
Tédenat and Fuster.	Cit. by Kolaczek.	(?)	(?)	(?)	Deltoid.	do.	do.	Primary muscle angioma.
Do.	do.	(?)	(?)	(?)	Biceps.	do.	do.	Primary muscle angioma.
Do.	do.	(?)	(?)	(?)	Quadriceps.	do.	do.	Primary muscle angioma.
Teevan	Brit. and For. Med. Chir. Rev. Vol. XXXII, p. 509.	17	F.	(?)	Semimembranosus.	do.	do.	Erectile.
Thorne	Occident. Med. Times, San F., 1903, Vol. XVIII.	22	M.	Several mos.	Latissimus dorsi serratus magnus.	do.	do.	Cavernous angioma. No pain.
Tillaux	Cit. by Rigaud.	12	F.	(?)	Superficial flexors of forearm.	do.	do.	Cavernous angioma. Burning, tingling, etc. Phleboliths. Median nerve involved.
Tricomi	Cit. by Coletti.	(?)	(?)	(?)	Sterno-cleido-mastoid.	(?)	(?)	
Tusini	Archivo per le Scienze Mediche XX, 1896.	(?)	(?)	(?)	Serrati muscles of back.	Excision.	Recovery.	Arterio-capillary angioma. (Rabdomio-angioma).

Author.	Reference.	Age.	Sex.	Duration.	Location.	Treatment.	Result.	Remarks.
Van der Spil..	Cit. by Alessandri.	(?)	(?)	....(?)	Masseter.	Excision.	Recovery.	
Vautrin.....	Cit. by Rigaud.	(?)	(?)	....(?)	Quadriceps femoris.	....do.	....do.	
Viannay	Provence Méd. Aug. 30, 1902.	26	F.	About 9 yrs.	Vastus internus.	Excision. Recurrence.	....do.	Cavernous angioma. Pain. Phleboliths. Excised 1898. Recurrence. Unable to extend leg. Not circumscribed. Excision 1902.
Vincent.....	Lyon Méd. 1877.	12	M.	2 yrs.	Pectoralis major.	Excision.	....do.	Cavernous angioma. Circumscribed.
Virchow	Krankhafte Geschwülste, III, p. 366.	(?)	(?)	....(?)	Thenar eminence.	....do.	....do.	Cavernous angioma.
Volkmann....	Dictionnaire Dechambre, XI, p. 117.	(?)	(?)	....(?)	Flexor profundus digitorum.	....(?)	....(?)	
Warneck.....	Centralblatt f. Chir., 1896, CLXXXIII.	28	F.	12 yrs.	Rectus abdominus.	Excision.	Recovery.	Simple angioma. Pain. Diagnosed fibro-sarcoma.
Case I.....	Dr. Halsted's Clinic Johns Hopkins Hosp.	18	M.	3½ yrs.	Vastus internus.	....do.	....do.	Operated on one year ago outside the Hospital. Recurrence. Cavernous angioma. Slight pain. Circumscribed. Blood cyst. Diagnosis benign tumor.
Case II.....	.....do.	25	F.	14 yrs.	Gastrocnemius, soleus.	Partial excision.	....do.	Cavernous angioma. Pain. Deformity. (Talipes equinus). Diffuse. Diagnosed chronic myositis.
Case III.	.....do.	17	M.	Post-traumatic, 10 yrs.	Flexor sublimis digitorum, flexor profundus digitorum, and intermuscular tissue.	....do.	....do.	Venous angioma. Diffuse. Pain. Phlebolith.
Case IV.....	.....do.	5	M.	Congenital.	External and internal obliquis abdominis.	Excision.	....do.....	Cavernous angioma. Diffuse. Pain. Phleboliths. Somewhat compressible.
Case V.....	.....do.	23	M.	Post-traumatic, 18 yrs.	Masseter, buccinator.	....do.	....do.	Cavernous angioma. Diffuse. Pain. Phleboliths. Somewhat compressible.
Case VI.....	Robert Garrett Children's Hosp., Balto., Md.	12	F.	Congenital.	Tibialis anticus, extensor proprius hallucis, extensor longus digitorum, peroneus tertius.	Explored.	Improved.	Venous angioma. Diffuso. No pain. Discovered during operation for excision of varicose veins of leg.

encapsulated tumors are not apt to spread, and give a better prognosis than the diffuse. There is no instance on record where an encapsulated angioma has become diffuse. The prognosis as to life is excellent.

Treatment.—Local applications, the insertion of setons, magnesium darts, and ivory pegs have been tried with little success. Various irritating and coagulating fluids, such as boiling water, nitric acid, alcohol, tannic acid, perchloride of iron in different strengths, tincture of iodine, aromatic ammonia, lead acetate, chloride of lime, and many other substances have been injected, hoping to produce scar tissue eventually, and in this way block out the tumor, but with no success in the majority of cases; while in some, abscess, slough, and even death has followed the injections. Electrolysis has proved futile in most cases, but Heide reports a case treated by electrolysis, giving satisfactory results. He used a current of 30 to 40 milliampères for 3 or 4 minutes at each sitting over a considerable period of time. Ignipuncture with the Paquelin cautery has been a trifle more successful, but the only method of treatment promising permanent cure is excision, or at least partial excision. Simple exploratory incision and inducing the formation of scar tissue will sometimes improve the condition (Case VI). If the tumor is superficial, circumscribed, and feebly adherent to the muscle then exicision is easy. If, however, it is diffuse and very deep in the substance of the muscle, excision is exceedingly difficult, and large portions, if not all, of the muscle or group of muscles involved must be removed. Hemorrhage is sometimes profuse and hard to control, and it may be necessary to tie the peripheral vessels. If this does not stop the bleeding and none of the other means at hand are effectual then it may necessitate amputation. Riethus amputated the leg in a case of diffuse cavernous angioma, with recurrence 8 months after first operation, when partial excision was done. Nast-Kolb amputated the leg in a case of cavernous angioma without previous partial excision. These are the only cases reported, and it might have been wise to attempt further partial excisions before resorting to this radical procedure.

The tabulated list above is compiled from all the cases reported up to the present time, and while it is incomplete in many of its details, it gives us some interesting information. Although the tumor was specified as congenital only 25 times, there seems to be no doubt but that it is congenital in the great majority of cases. In 12 instances there is a definite post-traumatic history. There was little choice as to sex—male 50, female 53. Duration before operation 3 months to 32 years. Youngest at time of operation 2 years. Oldest at time of operation 52 years. The tumor was simple, 14; cavernous, 98; mixed, 13; circumscribed, 15; diffuse, 31 times; the diffuse variety, however, probably being much more common than these figures show.

Pain is really the most constant symptom, and was emphasized in 51 cases. Notes on compressibility and change in size on changing position are meager. Deformity in 8; phleboliths in 17; nerve trunks involved in 7; bony formation in 5; treatment by excision complete or partial, 119; ampu-

tation, 2; recurrences, 3. The lower extremity was involved in 62 cases; the upper in 42; trunk in 30; face, 13; and neck, 4. The individual muscles or groups of muscles most frequently involved are quadriceps femoris, 27; forearm, 13; trapezius, gastrocnemius and triceps, 8 each; masseter, 7; latissimus dorsi, semimembranosus, sacrolumbar, and calf muscles, 7 each; pectoralis major and gluteii, 5 each; deltoid, 4; semitendinosus, and thumb muscles, 3 each.

Conclusions.—Primary angioma of muscle is no longer a very rare condition as the 153 cases reviewed in this paper indicate. It is a slow growing tumor, usually congenital in origin, but without doubt follows trauma in some instances. It may occur in any striated muscle, and the muscle in which it forms, plays a perfectly passive rôle. Compressibility, change in size on raising or lowering the limb, and pain are the three typical symptoms, although any one or all of them may be lacking. The clinical diagnosis is very difficult when the typical symptoms are indefinite, and many cases are not correctly diagnosed until operated upon. The skin is usually normal; the tumor is as a rule soft, but may be hard, smooth or lobulated, movable or fixed, circumscribed or diffuse. It varies in size from a small nut to a child's head. The X-ray may give some assistance in diagnosis when bony formation is present. There are two principal varieties—the simple, which is comparatively rare, and the cavernous, the latter being the most common; however, both varieties may be present in the same tumor. On section the characteristic appearance of a blood-filled sponge, brownish-red in color is seen. There is no particular afferent or efferent vessel. Microscopically the typical picture is that of blood spaces lined with endothelium, containing normal blood, and surrounded by walls of smooth muscle and connective tissue.

Phleboliths are often present in the blood spaces as well as in the dilated veins, and are thrombotic in origin. The only treatment of particular value is excision, and if complete, it is practically sure to cure the condition; however, partial excision has in a number of cases proved equally efficient, although 3 recurrences are on record following partial excision.

The *prognosis* is excellent.

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PULMONARY COMPLICATIONS FOLLOWING ANÆSTHESIA.

By Otis B. Wight, M. D., *Portland, Oregon.*

(*Formerly House Officer, The Johns Hopkins Hospital.*)

In the Gynecological Service of the Johns Hopkins Hospital prior to August, 1903, about 9000 patients had been anæsthetized and of these 29 developed pneumonia soon after; six, or 21 per cent, of them died. Twenty-four cases developed the disease during the first 8 days following the use of the anæsthetic; in but one of the 5 cases which developed later did the anæsthetic seem to be a cause of the disease. Of the 29 cases, 12 were diagnosed as the lobar type of pneumonia and 17 the bronchial type. This percentage of lobar to bronchial pneumonia is rather low for nearly all the statistics show 75 to 90 per cent of the post-anæsthetic pneumonias are of the lobular type. All of theso pneumonias save one followed the use of the following anæsthetics: chloroform alone, chloroform and ether, ether alone, nitrous oxide and ether, cocaine and gas (one case).

Among these 29 cases there was in 5 no report as to preoperative lung condition; in 5 others prolonged expiration or a few scattered râles were found; in the others physical examination gave only normal findings.

The duration of the anæsthesia plays considerable part in the production of pulmonary complications, for in this series there were only 4 cases which were anæsthetized for 1 hour or less and 11 of the 29 cases took the anæsthetic for 2 hours or more. Ether early is a stimulant to the circulatory apparatus, later it loses this action, while chloroform acts as a depressant from the start—this combined with prolonged loss of bodily heat and long-continued irritation of the lung tissue would tend to aid materially in the production of postoperative complications.

Wound healing was not affected by the development of pneumonia, and this is in accord with the general view of writers on this subject.

Odd features in this series were that one patient, after examination under ether, developed pneumonia from which she recovered completely, and was later operated on a second time under ether without further lung complication. Another, that two patients operated upon recovered without pulmonary lesions, but later both had a second operation and developed pneumonia.

Cocaine.—The statistics from many of the foreign clinics where cocaine is used as a local anæsthetic (in this I do not refer to spinal anæsthesia) show a surprisingly high percentage of lung complications, especially pneumonia, a higher percentage than follows anæsthesia by inhalation. To me the most reasonable explanation is that offered by Dr. J. F. Mitchell of Washington, formerly Resident Surgeon at the Johns Hopkins Hospital, that many of these operations were done in the upper abdomen and these patients were kept flat on their backs for many days following the operative procedure. Now the tendency is to put these cases in a semi-sitting position from the start, and to get them out of bed as early as possible. Quoting from a personal letter from Dr. Mitchell regarding the prevalence of pulmonary complications following anæsthesia: "50 of my hospital operations last year were done under local anæsthesia and I have yet to see a case of pneumonia following the nse of this method."

Statistics.—Here are presented reports from a few representative clinics. I would refer those desiring a complete review of the foreign literature and statistics up to the end of the year 1906, to the article by Bibergeil.

Author.	Operations.	Cases of Pneumonia.	Morbidity percentage.	Deaths.	Mortality percentage.
Bloodgood [1]	459 hernias	7	1.5	3	42
Mikulicz [2]	1,881	45	2.2	24	53
Czerny [3]	1,302	52	4.		
Johns Hopkins Hospital (Gyn. service) ..	9,000 anæs.	29	.3	6	21
Derjushinsk [4]	4,946	43	.9		
Magaw [5] (Rochester, Minn.)	14,000 anæs.	No deaths directly due to anæsthesia.			
Bibergeil [6] (Berlin)	3,909	135	3.4	38	28

Other complications met with: 12 lung emboli, 9 lung infarcts, 82 febrile bronchitides, 12 lung abscesses, 19 pleurisies, 13 empyemas.

Lobar Pneumonia.—Lobar pneumonia following anæsthesia apparently differs from lobar pneumonia seen in the medical wards in:

1. Temperature, which is lower and rarely reaches 103°; the curve is more irregular and not so steady as in the typical case.

2. Duration usually shorter and rarely a true crisis.

3. Greater freedom from complications (empyema).

4. Central type of pneumonia, lung signs developing late. At first râles, with slight dullness, fever, and quickened pulse. About the time temperature begins to fall or a day or so before, dullness becomes more marked and there is definite bronchial breathing.

5. Cough not marked or severe and sputum rarely blood-tinged.

The second or third day after the operation is the common time for the development of symptoms, which are those typical

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[1] Johns Hopkins Hospital Reports, Vol. VII, part 5.

[2] Centralbl. f. Chir., 1897, Vol. XXVI; Archiv f. klin. Chir., Bd. LVII, Hft. 2.

[3] (Quoted from 6.)

[4] Centralbl. f. Chir., 1903, No. 25.

[5] Surgery, Gynecology, and Obstetrics, 1906, III, 795.

[6] Archiv f. klin. Chir., Bd. LXXVIII.

of pneumonia; chill, pain in the side, cough, and fever. The right lung was most often involved, the lower and upper lobes were about equally affected. The mortality in these 12 cases was 4, or 33 per cent, about the same ratio that the accepted statistics show for lobar pneumonia due to the pneumococcus. No cases of empyema or abscess of the lung developed.

Bronchopneumonia.—Hypostatic pneumonia is separated by some authors from lobar pneumonia, in being chiefly characterized by a development of small patches of pneumonia at the bases of the lungs in elderly people and in patients seriously weakened by disease where such causes as aspiration, irritation of the mucous membranes by the anæsthetic, shock, etc., could be largely excluded. They will be considered here together.

There were 17 cases with 2 deaths, 12 per cent mortality. This lesion generally appeared from 1 to 3 days after operation, ushered in by a chill and rise of temperature, which was higher in the evening and did not follow the usual curve of temperature in lobar pneumonia; cough was not a marked feature. Physical signs were mucous râles throughout the chest, especially in the lower lobes; small areas of lung tissue, with blowing breath sounds, in which partial or complete dullness was brought out by percussion; at times this dullness did not appear until shortly before the temperature began to drop. Cyanosis and very rapid respiration were rarely noticed. In the cases terminating in recovery the disease lasted from 7 to 12 days.

Bronchitis.—Thirty cases, no deaths. By this is meant a condition characterized by a feeling of tightness in the chest, slight fever, and squeaking or mucous râles mainly found at the bases of the lungs with no dullness on percussion. These cases were at no time seriously ill, and the signs and symptoms cleared up promptly without retarding convalescence.

Pleurisy.—A true fibrinous or serous pleurisy unassociated with pneumonia is one of the rarer complications of anæsthesia. Only a small number of the patients developing pneumonia had the characteristic creaking or grating sounds diagnostic of pleural involvement. The few cases of fibrinous pleurisy that did occur had the typical symptoms: sharp stabbing pain in the side, dry painful cough, and moderate fever. These symptoms disappeared after a few days and did not retard the healing of the wound. A smaller, but unknown percentage of these patients developed an effusion as shown by irregular temperature, flatness on percussion, and absence of breath sounds. These signs cleared up rapidly, and in no case was thoracentesis necessary. Pleurisy developed in nearly every case within the first 48 hours, but caused no deaths. Whether small emboli are the cause of these pleurisies by forming infarcts is impossible to say, though many writers claim this to be the main factor in their production.

Causation.—Many theories have been offered as to the etiology of post-operative lung complications, but it would seem as if in each case more than one of these theories is necessary to explain their origin.

1. Irritant action of anæsthetic.
2. Aspiration of mucus and vomitus and hypersecretion of mucus.
3. Emboli.
4. Toxic effect of anæsthetic on heart and blood-vessels.
5. Presence of pneumococci and other bacteria in mouth and throat.
6. Extension of infection through subdiaphragmatic space.
7. Cooling of the body.
8. Limitation of lung expansion.
9. Lessened resistance of patient.

1. *Irritant action of anæsthetic.*—Ether of all anæsthetics used has the most irritant effect on the mucous membrane of the bronchi and the alveolar cells. This action is direct and seems to depend almost wholly upon the percentage of ether in the air inspired during anæsthetization, for since the use of the open-drop method and the greater daring in its administration, the frequency of pulmonary complications following the use of ether has been greatly diminished. Next rank ethyl bromide and ethyl chloride, which have nearly the same effect, though now used only rarely, and principally as a preliminary to ether. Chloroform is not thought to irritate the lining membrane of the bronchi.

2. *Aspiration of mucus and vomitus and hypersecretion of mucus.*—Ether by its irritant and stimulant action causes often hypersecretion of mucus and with this there is constant danger that some portion of this mucus may pass down and enter the bronchi and fill up some of the alveoli, carrying with it the pneumococcus and other organisms. This is also true of vomitus, for the aspirated stomach contents may fill many of the alveoli and by their irritant action set up inflammation. Hypersecretion of mucus at times seriously interferes with the patient receiving a small, constant supply of the anæsthetic, for the mouth must be swabbed out frequently and there are often attempts at coughing.

The value of atropin, 1/100 of a gr., given hypodermically half an hour before the anæsthetic is started, is questionable, as many clinics where this method has been tried have given it up as valueless.

3. *Emboli.*—Some authors claim that these are the most important cause through plugging of one of the smaller branches of the pulmonary arteries, with infarct formation. Unless the additional cause be added of infection of the area by pneumococci or some other organism, it would seem as if this theory were sufficient to account for partial or complete lobar consolidation. That emboli are often a factor is no doubt true, but other factors must play an assisting rôle.

4. *Toxic effect of anæsthetic on heart and bloodvessels.*—Chloroform in this respect seems to be the most dangerous of the anæsthetics used. It has a definite depressant effect on the heart and bloodvessels if given too rapidly in the early stages of anæsthesia in too great concentration. Its action may be delayed for several days, when the heart may fail, due to some slow toxic action on the muscle.

Cases of right auricular dilatation usually follow anæsthesia if this lasts an hour and a half or more, but hypostatic congestion of the lung is rarely seen in short operations, un-

less in old people with cardiac hypertrophy and sclerotic arteries.

5. *Presence of pneumococci and other bacteria in mouth and throat.*—It has been proved that from 15 to 20 per cent of healthy persons harbor the pneumococci constantly in the mouth or throat, and sometimes the streptococcus. By aspiration of mucus, these organisms can easily reach the bronchii and alveoli and there develop, if the irritant nature of the anæsthetic used has injured the lining membrane. It is possible that in septic cases the infection has been caused by the blood, the organism penetrating the wall of the alveolus which has been injured by the irritant action of the anæsthetic.

6. *Extension of infection through subdiaphragmatic space.*—An infection may spread from an abscess of the appendix, a perforated duodenal or gastric ulcer, etc., into the right subphrenic area and thence by the lymph channels under and through the diaphragm to the right pleura. On the left side the anatomical relations prevent any infection travelling upward under the diaphragm.

7. *Cooling of the body.*—A loss of temperature of $\frac{1}{2}$ to 1° may follow prolonged anæsthesia, even when no other factor is concerned. The cold glass or iron work of the table on which the patient is laid; the placing of wet, sterile towels about the site of incision; the use of irrigating solutions, and the conveyance of the patient through cold halls, all tend toward cooling the body and often chill it seriously. Some of these factors can readily be eliminated from operations, and it may be said fairly that it is largely due to carelessness on the part of the surgeons if patients are chilled in such ways.

8. *Limitation of lung expansion.*—Recent writers lay great stress on this point, claiming that, especially in operations above the umbilicus, pain in the incision on deep breathing, for the first two or three days is so severe that patients endeavor to keep the abdominal muscles and diaphragm as still as possible and so limit normal respiration and the æration of the alveoli. This limitation is also influenced by meteorism; by the use of the Trendelenburg position on the operating table, and that used in operations on the kidney through the loin.

9. *Lessened resistance of the patient* through illness, anæmia, the shock of a long operation often with considerable loss of blood, slight bronchitis, and the time of year are other factors that have occasionally decided influence in the production of pulmonary complications.

Prevention.—Disinfection of the mouth and nose by mild antiseptic gargles and douches should be a routine measure.

Careful administration of the anæsthetic by the drop method on an open mask, given slowly and steadily at first so the patient is not suffocated and does not struggle is all important.

In regard to position the head should be low and to one side so that mucus can flow out easily; the jaw kept forward to keep the tongue from dropping back into the pharynx. More care should be taken to keep patients warm and dry. There should be warm pads on the table and warm jackets and leg coverings should be worn. The sterile dressings should be dry. The patient should be warmly covered up when removed from the operating table to bed.

ON THE RELATION OF THE PARATHYROID TO CALCIUM METABOLISM AND THE NATURE OF TETANY.

By W. G. MacCallum, M. D.,
Associate Professor of Pathology,

and

C. Voegtlin, Ph. D.,
Assistant in Medicine in Charge of the Chemical Laboratory of the Medical Clinic, Johns Hopkins University, Baltimore.

Preliminary Note.

Several clinical studies of such conditions as rickets, osteomalacia, etc., have suggested the possibility that tetany might stand in some relation to disturbances in calcium metabolism and this has been further suggested by the work of Loeb and J. B. MacCallum on the effect of various salts in the production of muscular twitchings and the counteraction of these effects by calcium. Particularly striking also are the observations of Verstraeten and Vanderlinden, Halsted and others on the mild character or absence of tetany after parathyroidectomy when the animal is kept upon an abundant diet of milk which is rich in calcium.

We have, therefore, undertaken a study of the calcium metabolism of animals in which tetany is produced by parathyroidectomy and of the relations of various salts, especially those of calcium to the tetany thus produced. A later publication will give the details of this work which is not yet complete, but the results already obtained may be set down here.

All violent symptoms produced by parathyroidectomy, muscular twitching, and rigidity, tachypnœa, fibrillary tremors, increased rapidity of the heart beat, etc., may be almost instantly cured by the intravenous injection of a solution of a calcium salt. We have usually employed the acetate or lactate in 5 per cent solution. Subcutaneous injection or the

introduction of the solution into the stomach are quite as effective but act more slowly. The condition of complete well-being attained in this way lasts for perhaps 24 hours when tetany may reappear, but disappears immediately upon renewed administration of calcium. Injection of magnesium salts has a somewhat similar effect in causing the symptoms of tetany to disappear, but the results are obscured by the toxic anæsthetic action of the salt. On the other hand the injection of potassium salts in tetany not only causes no amelioration, but actually intensifies all the symptoms. Similar results are expected from other salts of this character which, as yet, have been imperfectly tested. After the tetany is thus accentuated by the injection of potassium it may be caused to disappear completely by the injection of a calcium salt. It is found necessary to use in such a case a larger amount of calcium to overcome the effect of the potassium.

Our studies of the excreta in parathyroidectomised animals on a constant diet or during starvation tend to show an increased output of calcium as compared with the control, but these observations are, so far, so incomplete, that we are unwilling as yet to make any definite statement on this point.

On the other hand the analysis of the blood taken from a dog during tetany shows a calcium content which is only about half that of the normal dog on the same constant diet. The analysis of the brain, muscles, and other tissues is in progress, and its results are looked forward to with especial interest.

It seems possible to construct at least a plausible working hypothesis to explain these results, although this can at present be only a superficial explanation. Apparently the parathyroids control in some way the calcium metabolism so that upon their removal a rapid excretion, possibly associated with inadequate absorption and assimilation deprives the tissues of calcium salts. There arises in this way a condition analogous to that described by Loeb and J. B. MacCallum who showed that muscular twitching could be produced by the introduction of salts capable of precipitating the calcium in insoluble form, and removed by the addition of fresh soluble calcium salts. In the case of tetany, however, the central nervous system seems to be especially affected as has been shown by experiments in which muscles isolated from nervous control showed no twitching during tetany.

The certainty and rapidity with which the symptoms of tetany are dispelled by the administration of calcium salts makes it seem probable that this observation will have some therapeutic importance not only in postoperative tetany, but also in the various forms of tetany which occur spontaneously in children and in connection with infectious diseases, pregnancy, lactation, etc. It seems possible that the tetany of lactation may be due to the great drain of calcium in the production of the calcium rich milk, especially in individuals in whom there is some parathyroid insufficiency, and the validity of this hypothesis is being tested.

If further study confirms the accuracy of these observations it may be possible to compare the condition with that in pancreatic diabetes in which the loss of control of the carbohydrate metabolism by the destruction of the Islands of Langerhans allows an abnormal carbohydrate excretion and tetany might accordingly in that case be spoken of as *"diabetes calcarius."*

PROCEEDINGS OF SOCIETIES.

THE JOHNS HOPKINS MEDICAL SOCIETY.

December 2, 1907.

I. **Exhibition of Cases.** Dr. Cushing.

II. **Exhibition of Cases.** Dr. Williams.

III. **Effect of Changes of Blood Pressure upon the Pulse Rate.** Dr. Eyster and Dr. Hooker.

The experiments described in this paper were concerned with an attempt to determine whether the decrease in pulse-rate that results from a considerable increase of arterial pressure is due to a direct action of the increased pressure upon the cardio-inhibitory center, or whether this center is stimulated through afferent nerves and the slowing thus brought about reflexly.

These experiments may be divided into groups as follows:

1. Decrease of pulse-rate from rise of pressure produced by ligation of different portions of the thoracic aorta in dogs. Occlusion of the ascending aorta (with consequent rise of intracardiac pressure) was without effect upon the pulse-rate; in fact, even an increased rate sometimes occurred. Occlusion of the transverse or descending thoracic aorta caused a decrease in pulse-rate.

2. Decrease in pulse-rate was obtained in dogs and rabbits by temporary increase of pressure confined to the thoracic aorta. The previous pulse-rate or a more rapid one occurred when the pressure was relieved.

3. Increase of pressure confined to the cerebral arteries caused also a marked slowing of the pulse.

4. When the increase of pressure was confined to the heart no definite slowing of the pulse-rate was observed.

5. When the increase of pressure was confined to the coronary arteries, the results of these experiments were not very conclusive. In some cases slowing occurred, but never to the marked degree that was obtained from increase of pressure within the aorta.

The phenomenon of decrease in pulse-rate from increase of arterial pressure in animals with intact vagi is therefore due to two factors. These are a direct effect of the increased pressure upon the cardio-inhibitory center and a reflex stimulation of this center through afferent nerves arising from the

aorta and probably not from the heart. The experiments are to be continued with the view of determining through what nerves these afferent fibers are carried to the cardio-inhibitory center.

IV. On the Excretion of Urotropin in the Bile and Pancreatic Juice. Mr. Crowe.

The author reported the results of a series of experiments, made to determine the fate of urotropin in the body and its efficacy as a sterilizing agent in the bile and other secretions of the body.

It was determined by experiments on dogs that after the administration of urotropin by mouth, it was excreted both in the bile and pancreatic juice.

Hehner's test for formaldehyde was used, and by rough colorimetric comparison it was estimated to be equivalent to a 1:12,000 solution of formaldehyde. It was present in the bile contained in the gall-bladder 24 hours after giving 15 grains of urotropin by mouth.

In view of these findings, observations were made on a series of patients in the hospital who had biliary fistulæ. Bacteriological studies were made before and after giving the drug; and in every case the infecting organisms rapidly disappeared when the dose of urotropin given was 75 grains or more a day. As in the urinary bladder the organisms appear again as the dose is decreased.

The bile discharged through the fistula, when acidified and distilled, always gives the test for formaldehyde, the amount present varying with the amount of urotropin given.

In every case the patient's general condition improved, the discharged bile changed from a dirty, turbid fluid, to the golden-yellow of normal bile, and the fistulæ closed rapidly.

Urotropin was shown to be present repeatedly in the cerebrospinal fluid, even after very small doses by mouth. In one case with a badly infected cerebrospinal fistula, with sloughing and a purulent discharge, the organisms gradually disappeared after urotropin was begun, the fistula closed, and the patient made a good recovery.

Formaldehyde was shown to be present also in the pus obtained from a gonorrhœal knee-joint; but sufficient time has not as yet elapsed to report on its therapeutic effect in this case.

December 16, 1907.

Dr. Finney presiding.

I. A Family of Hemeralopes. Dr. Bordley.

This paper will shortly appear in the Johns Hopkins Hospital Bulletin.

Discussion.

Dr. Randolph.—The part played by heredity in bringing about certain abnormal conditions of the eye is of course an old story. Cohn reports instances where glaucoma has occurred in members of the same family through four generations. The presence of cataract in members of the same family for several generations is not an uncommon observation and we have seen not a little in literature within the past few years of the so-called "hereditary optic nerve atrophy." The cases just reported are unusually interesting. I am glad to see that Dr. Bordley adheres to the Continental interpretation or definition of the word *hemeralopia*. While I appreciate the position taken by most British and American ophthalmologists on this point, I think the reason for regarding hemeralopia as night-blindness, not day-blindness, is the better reason. As we know, almost all the standard works on ophthalmology in English nowadays refer to hemeralopia as a condition in which the individual is unable to see during the day and is only able to see by reduced illumination. Just the opposite view is taken by such writers as Fuchs, Schweigger, Meyer, and others, who hold that hemeralopia is a symptom by reason of which the person sees better by day than night, a view which I have usually held. Personally I should like to see the words hemeralopia and nyctalopia dropped and the words night-blindness and day-blindness substituted.

In answer to an inquiry by Dr. Boggs, Dr. Bordley stated that no members of this family of hemeralopes exhibited nutritional disturbances of any other organs of the body. In reply to questions by Dr. Hurd, the speaker said that the patients usually died in the seventh decade of life. Some showed senile changes rather early; one of the girls, who is about 30 years old, has an arcus senilis and markedly sclerotic arteries.

II. Exhibition of Cases. Dr. Randolph.

The first case which I have to present this evening is one upon which I have recently operated for cataract. It is interesting to me for two reasons, first because at the operation I was confronted with—in my experience—a unique difficulty—nystagmus. One can readily imagine the difficulties attendant upon making the corneal incision and delivering the lens from an eye which is constantly moving from side to side. About 11 years ago she was operated upon unsuccessfully for cataract in her right eye by a local ophthalmologist. She came to me soon after to see if I could help her. I found the pupil closed with a dense, organized exudate and I could offer her no encouragement so far as that eye was concerned. Since that time her left eye has been growing slowly blind and a few weeks ago she presented herself to me for operation. There was nothing remarkable about the appearance of the eye before the operation except that any effort of the eye to move outward toward the vertical plane would be accompanied with clonic spasms. I have never been quite clear as to the cause of this condition. I found considerable difficulty in making the corneal incision and more than once after entering the anterior chamber the eye was drawn inward so far as to almost free itself entirely of the knife. As a result I think of this constant movement which I could not control with fixation forceps the counter-puncture was made too high up and the opening through which the lens was to pass was too small. I was equally unsuccessful in enlarging the opening to any great extent. The

lens was dislocated into the vitreous and it was only after the most delicate sort of manipulation that I succeeded in getting it out.

I don't think I have ever sent a patient from the operating table with less hope on my part of a good result. There is hardly a mishap which is more to be dreaded than an incision too small for the passage of the lens. The opening is not easy to enlarge and when we have finished the operation we leave behind a bruised wound and the very conditions favorable to infection. The eye was irrigated freely with a warm sterile salt solution and she was put to bed. The case is interesting to me again as showing the value of cold applications in these infected wounds. A large bowl containing a block of ice was placed near her and small pads of gauze which had lain on the ice were kept on the eye constantly night and day and this was kept up for a week. Of course atropin was employed in the usual manner. I think, however, that the good result is to be attributed almost entirely to the effect of lowering local temperature and thus rendering conditions in the conjunctival sac unfavorable for the multiplication of bacteria. An ordinary bandage or even the shield would have resulted I believe in loss of the eye. As it is she has good vision.

The second case is one in which I removed a large piece of steel from the vitreous of the right eye. The foreign body had been there for nearly three weeks. It was localized by the so-called "Sweet Method." It was found to have passed little more than half way across the eye and lay in the posterior part of the vitreous. An incision was made a little below its location and it was removed with great difficulty owing to its large size and irregular borders. Not a little vitreous was lost. Cold applications were made in the same manner as in the cataract case and he has now the ability to count figures in the outer half of the field. It has always been my rule to apply cold in these cases of penetrating wounds of the eye-ball and I think it has a most important bearing upon the outcome in this class of cases. It is the first time, however, that I have used cold in the after treatment of a cataract case which after all is nothing more than a penetrating wound of the eye-ball. As I look back upon some of my unsuccessful cataract operations I recall more than one where I believe the result would have been entirely changed if I had adopted this simple measure.

III. The Practical Value of the Demonstration of Spirochæta Pallida in the Early Diagnosis of Syphilis. Dr. Geraghty.

This paper is to be published in the Johns Hopkins Hospital Bulletin.

Discussion.

Dr. Finney.—This report of Dr. Geraghty's is of very great practical importance. I know of several cases where severe surgical operations might have been avoided, had we had so definite a diagnostic method as Dr. Geraghty has described. I have encountered several cases in the past where it was utterly impossible to differentiate chancre from cancer. I think this method of Dr. Geraghty's is of tremendous value,—more perhaps to the general surgeon than to the specialist, for it is the general surgeon who is most likely to encounter cases of extra-genital chancre where the detection of the Spirochæta Pallida would be so advantageous.

January 6, 1908.

Dr. Finney presiding.

I. Exhibition of Cases. Dr. Barker.

Dr. Barker reported two cases of cerebrospinal meningitis that had been treated by injections of Flexner's meningitis serum.

Case 1. A boy, aged 6 years, was admitted to the hospital with a history of a 6-weeks' illness. He was supposed to have had acute lobar pneumonia 6 weeks previously. Afterwards he developed a rise in temperature, headache, earache, retraction of the neck, and vomiting. On admission the boy was screaming continually, his neck was stiff, he showed Kernig's and Babinski's signs, as well as headache, and extreme sensitiveness of the skin. There was no strabismus and no opisthotonos.

A lumbar puncture was done. The intra-spinal pressure was 400 mm.; 25 cc. of fluid were removed. This fluid contained small flocculi. Cultures and smears showed diplococci intra-cellularis to be present in the fluid. At this time the boy's temperature ranged from 98.0° to 104.0°, the rise occurring in the evening. Examination of the ears revealed bulging membranes. After puncture of the membranes there was a drop in the temperature.

Four days later at another lumbar puncture the pressure was 520 mm.; 35 cc. of fluid were removed in which diplococci were again found. After this second lumbar puncture 25 cc. of serum were injected into the spinal canal. Within 12 hours the temperature fell from 102.4° to 98.0°; the boy slept soundly and felt better.

The following evening there was a rise of temperature; 20 cc. of cerebrospinal fluid were now removed and replaced by serum. At this time the pressure was 160 mm. Forty-eight hours later a fourth lumbar puncture was done when the pressure was found to be 260 mm. and 20 cc. of fluid were removed and the same amount of serum injected. The fluid was clear and contained few diplococci. At this time the temperature was normal. Several later specimens of fluid have been withdrawn, of which the last two have been sterile.

Improvement has been marked. The stiffness of the neck and headache have disappeared. In all, 65 cc. of serum has been injected. The case is interesting because of its late recognition and because the serum seems to have been beneficial where employed in a late case. Flexner thinks the serum acts best in early cases.

Case II. A boy, aged 15 years, was admitted to the hospital on the evening of the fourth day of the disease. He had a well-defined case of meningitis. A lumbar puncture showed 400 mm. pressure; 35 cc. of a very cloudy fluid were withdrawn and 15 cc. of serum injected. Diplococci were found

in the fluid. During the transfer of fluid the patient's condition was alarming. His blood-pressure ranged from 160 to 200 mm., where it remained for 12 hours. His temperature was 103.0° to 104.0°.

The next day the boy's temperature was 100.0° and his pulse 80. He was comfortable and his squint and opisthotonos had disappeared. A second lumbar puncture showed 520 mm. pressure and 40 cc. of cloudy purulent fluid were removed in which the diplococci were hard to find; 30 cc. of serum were injected. The next day, the seventh day of the disease, 20 cc. of serum were injected after a third lumbar puncture. The patient's condition improved markedly though his neck was still stiff. His temperature fell gradually to below 100.0° to-day.

This afternoon his temperature suddenly shot up to 103.4°. A fourth lumbar puncture showed a pressure of 480 mm.; 46 cc. of cloudy fluid were removed and 25 cc. of serum injected. This elevation of temperature this afternoon looks like a relapse, though it may be due to a complicated infection. It is impossible to talk about the value of the serum from the results obtained in these two cases. Flexner reports 75 or 80 cases treated with this serum, in which the mortality has been less than the ordinary mortality of meningitis cases. The serum is probably not an antitoxic serum. It is not known exactly what it is.

Discussion.

Dr. Randolph.—Were the eye-grounds examined in these cases?

Dr. Emerson.—Case I showed choked disc on left side. Nothing abnormal was to be made out in the second.

Dr. Randolph.—Accounts of epidemics are characterized by different kinds of eye symptoms. Some 10 or 12 years ago, in an epidemic in the western part of the state, the eye symptoms were localized in the back of the eye; in some epidemics they are localized in the muscles. In this epidemic they consisted in an enormous dilatation of the veins of the retina, which in some cases reached such remarkable size as to suggest the diagnosis of the case. There were no ear symptoms in this epidemic that I can recollect. In another epidemic reported from Heidelberg the changes were largely in the choroid.

II. Pancreatic Disease. Dr. Emerson.

The author thought this a subject that has not been sufficiently emphasized in the teaching and practice of clinical medicine. He prefaced his remarks by a discussion of various anatomical and physiological characteristics of the pancreas. Multiple pancreases are infrequent; there are only 14 instances reported. While there are many cases of accessory pancreases on record, there are in the literature only a very few reports of such organs possessing a proper duct. Only three cases of complete encircling of the duodenum by a pancreatic ring are on record. The pancreas normally enjoys a very central position in the body and has manifold relations; and it is therefore easy to understand why in trouble with the pancreas the other organs give the symptoms. It is in the triangle that is bounded on two sides by the duct of Wirsung and the duct of Santorini that chronic pancreatitis most often begins. We must remember in this connection that there may be a constant circulation of intestinal microorganisms through this triangle by way of the two ducts.

Cases may occur where it would be important to apply what we know about the influence of certain foods on the rate of pancreatic secretion. Normally the pancreas secretes 500 cc. of juice in 24 hours. Acids or a carbohydrate diet increase this secretion; alkalies, fats, or a protein diet diminish it. Therefore, if you put a patient on diabetic diet a pancreatic fistula may close of itself or render itself amenable to operative closure.

Again, the formula of the pancreatic secretion changes with the diet. There is lactase in the pancreatic juice of milk fed infants. In adults who do not drink milk the lactase here disappears; but, if a milk diet be resumed, the pancreatic juice of the adult will again contain lactase. Perhaps this fact explains the efficacy of the Dubois diet.

The etiology of acute pancreatitis that begins with hæmorrhage may rest upon the fact that certain substances like bile, bacteria, etc., activate trypsinogen. If then, the inert trypsinogen be converted into active trypsin by such agencies, it may well be that the latter ferment erodes or bores a hole through the tissues and sets up the disease.

The question of an increased or diminished pancreatic secretion is an interesting one. Finney has called attention to the occurrence, in patients who complain of indefinite abdominal symptoms, of a dilated duodenum. It is possible that this distention is due to increased secretion of pancreatic juice. No such relation has, however, been proved, though there are certain things in its favor. More important in symptomatology is a diminished pancreatic secretion. Bramwell was the first to cite a case of infantilism in a boy of 19 years who had not grown in 9 years. During all this period of arrested development the patient had had diarrhœa with bulky stools. Under treatment with pancreatic extract, the symptoms disappeared, only to recur with cessation of the treatment. Bramwell thought this a case of functional achylia pancreatica. Other cases have since been reported. It has been suggested that a good many atrophic nurslings are suffering from this condition.

Many cases of acute pancreatitis are not due to hæmorrhage. They may be due to infection, primary or metastatic; or to activation of the ferment. A true pancreatic apoplexy is often without symptoms; the patients are simply found dead. In some cases there are symptoms. In meeting with cases of acute pancreatitis it is always well to remember two things; first, that the condition is usually a recrudescence of an old pancreatic trouble that has been characterized by gall-stones, or nausea, or vomiting, or pain in the region of the ensiform cartilage; and secondly, that prodromata—slight nausea and vomiting, etc.,—are frequent. The ordinary case of this condition begins with retching and vomiting. It is an agonizing

retching. The vomiting is peculiar: incessant, and affording no relief. In only four of the cases analyzed was neither symptom present. In a few cases there was a bloody vomitus. Fæcal vomiting was comparatively frequent. Constipation is an especially important symptom. The constipation is complete and is due to a paralysis of the bowel wall. This paralysis when it passes away is followed by an uncontrollable diarrhœa. The diarrhœa may also occur early in the trouble on account of severe purging. In cases with fever, while the temperature is up, the leucocytes may rise to from 15,000 to 30,000. Glycosuria is an interesting feature. This seldom occurs in the records. In reality, it is not rare where the urine is examined early. To explain this it is only necessary to recall that Flexner has shown that any injury to the pancreas is followed by a temporary glycosuria that disappears in from 4 to 6 days, although the lesion is severe and lasting. It is supposed that nearly all cases would show glycosuria if the urine were examined early enough. In one group of cases the glycosuria develops slowly after the first week when a permanent glycosuria—a true diabetes—usually ensues. Cases that do not die may terminate in gangrene or abscess. In gangrene there are the same symptoms as in acute pancreatitis, with severe diarrhœa and a high leucocyte count. In abscess it is interesting that the abscess will float free while sugar in the urine is infrequent.

Chronic interstitial pancreatitis is commonly due to infections ascending up the ducts. There are no recognizable symptoms. It may be extreme without diabetes, for, as Opie has shown, the islands may be preserved. Atrophy of the pancreas may follow occlusion of the ducts by stones. In some cases there is glycosuria; in many, there is no glycosuria. In many the stools are normal although no juice reaches the intestine and the patient may show no gastric symptoms. In explanation of this latter condition several theories have been advanced; one, that there is an accessory pancreas; another, that there is a vicarious action of the intestinal wall; or again, that what was an external secretion may become an internal secretion. These factors may or may not be so but it is of interest to note that many cases have neither glycosuria nor intestinal features.

A question of interest is why fatty stools are so infrequent in pancreatic disease. The main factor in fatty stools seems to be the condition of the bowel wall. The wall may be no longer able to absorb the fat. In 1832 Bright showed that if you measure carefully the ingestion as well as the output of fat, there are some patients who void more fat than they take in. Perhaps here the fat is no longer used in the body but is eliminated like sugar in glycosuria. In most of these cases you have disease of the bowel wall or of the lymphatics of the bowel wall as in tabes mesenterica.

Discussion.

Dr. Finney.—The question of acute pancreatitis has many interesting points, especially in private practice. In the vast majority of cases the picture is one that at first suggests intestinal obstruction. I can remember 5 cases that I at first diagnosed acute intestinal obstruction. The thing that personally attracts my attention is the tremendous depression of the patient which is out of all proportion to the other symptoms. This is also accompanied by marked cyanosis.

In 2 cases of gangrene of the pancreas I have removed apparently the whole of the pancreas. Both cases are well to-day and are enjoying apparently excellent health.

The question of cancer of the pancreas is extremely interesting. The diagnosis is hardly ever made until operation. What impresses one is the absence of clinical symptoms; the patients begin to go down hill and that is all. There may be, too, slight distress that is referred to the gall-bladder and stomach. In these cases I have been able to do nothing except in those that are associated with intense jaundice.

NOTES ON NEW BOOKS.

Rabies; Its Place Amongst Germ-Diseases, and its Origin in the Animal Kingdom. By David Sime, M. D. (*Cambridge, Eng.: University Press, 1903.*)

"On the basis of these wide researches the following work has been grounded: It is a study of rabies in a threefold direction, its causation in the individual organism; its place amongst germ-diseases with the end of bacterial agency in the animal economy; and, lastly, its origin in the animal kingdom. The treatment of the subject is from a series of standpoints which, in view, are far-ranging through the realm of bacterial life and activity, and which are perhaps not the least important features of the work. Thus in the causation of the disease, the sensory rather than the motor nerve-roots of the cerebro-spinal axis are viewed as the specific nidus of the rabies-microbe, the pathogenic irritation of which is the prime lesion of the malady and underlying all the lesions. The rabies-microbe itself is described as of the simplest to the most complex structure. Far from being always simple and amorphous, it is viewed as in reality multiform, the quantity in the cerebro-spinal axis, and how it is organized, constituting the determining factor of every form of rabies. The paralytic element is taken as much the most important in canine-rabies itself, or in that of even the most attenuating division of the animal kingdom. In like manner the rabies of the sympathetic system is viewed as by far the most serious form of the disease, constituting the rabies characteristic of the intensifying division of the animal kingdom. It is taken as the sole factor of paralytic-rabies with its implication of the secreting system and of every infective form of the malady or of any paralytic element even in canine madness itself. In the consideration of the place of rabies amongst germ-diseases, the malady is treated and expounded as essentially a preventive rather than a prophylactic disease, these being described as the two great orders of the entire realm of germ-disease. Moreover, the particular tissue which forms the exclusive germinating ground of the prophylactic order, on the one hand, and likewise of the preventive orders, centric and peripheral, on the other hand, and as the formative factor of the order, is carefully examined. The very special prophylaxis of the prophylactic type of germ-disease and the general immunity of the preventive type are discussed and explained in detail, and as indicating how far the specific germinating tissue of the

particular order of protection induces the protection. On the other hand, the end of bacterial agency in the germinating tissues of the living economy is also carefully examined, and its vast importance in the origin and establishment of secreting-organs and as a factor of evolution itself. The following study of rabies is largely a revelation of this growth, or of the development of the pathological into the physiological. Again, in the consideration of the origin of rabies in the animal kingdom, the canine source of every form of the malady which presents itself is gravely doubted; and the instability and fading, final character of canine-rabies, as that of the entire attenuating division is demonstrated. The malady is viewed as, primarily, a germ-disease of the intensifying rather than of the attenuating division of the animal kingdom; and the universally excellent results which follow the use of the dog muzzle are accounted for and explained. These are problems of very profound practical not less than of theoretical interest, which are worthy of consideration in spite of their novelty; and the following work is a study of rabies in this triple cycle of relationship."

It would be impossible except at great length to review this work based as it is on the new problems stated in the quotation taken from the preface. Dr. Sime, it should be said, looks with profound respect on all the work done by Pasteur to elucidate this disease, and the author's treatment of the subject, although a novel one, is based on the discoveries of Pasteur. A work with so much original thought as Dr. Sime's, must be read to be understood—it cannot be condensed into a few short sentences by the reviewer, who advises students of this disease to read this volume. Dr. Sime may be right in his theories, but even if wrong, any reader will be stimulated who is willing to study them closely. R. N.

The Treatment of Disease in Children. By G. A. Sutherland, M. D., F. R. C. P., etc. Cloth. 311 pages. Price, $1.50. (*London: Henry Frowde and Hodder & Stoughton. Oxford University Press, New York, 1907*).

This little book has been written to help the general practitioner and especially the one just starting in practice. It is necessarily lacking in many details owing to the size of the book but in the main it gives the principles of treatment clearly and the methods of treatment advocated are in accordance with the most approved opinions of the day. The space devoted to the various topics is not always perfectly balanced, for example a disease of great rarity, congenital pyloric stenosis, has eight pages whilst the all important subject of diet is disposed of in seventeen. It is unusually difficult, however, to maintain a true sense of proportion in writing a small book upon such a large subject and on the whole, the author has done remarkably well. His ideas upon the subject of infant feeding are essentially English and the use of the percentage method of feeding is not discussed. He gives directions for the syphonage of pleural effusions which he prefers to aspiration. The book closes with a number of prescriptions selected from the Pharmacopoeia of the Paddington Green Children's Hospital.

A Text-Book of Physiological Chemistry. For Students of Medicine and Physicians. By Charles E. Simon, M. D., Professor of Clinical Pathology in the Baltimore Medical College. New (3d) edition. 8vo. $3.25. (*Philadelphia and New York: Lea Brothers & Co., 1907.*)

This text-book is undoubtedly one of the best of its kind. The author, who is well known to medical students and physicians through his admirable text-book on clinical microscopy, presents the subject in a clear and easy way. The book is up to date. One will find in it information about the latest discoveries in protein chemistry, as well as on ferments, hormones, and many other important topics. The methods of qualitative and quantitative determinations of chemical substances important to physiology are well selected and the accuracy of each of them discussed shortly. The relation of the different chemical compounds to pathology is briefly stated. In concluding we think that the book can be recommended to the medical student as well as to the general practitioner.

A History of Nursing. By M. Adelaide Nutting, R. N., Superintendent of Nurses, the Johns Hopkins Hospital, etc., and Lavinia L. Dock, R. N., Member of the Nurses' Settlement, New York, etc. In Two Volumes. Illustrated. (*New York and London: G. P. Putnam's Sons, The Knickerbocker Press, 1907.*)

In this excellent history the growth of "Nursing," or the care of the sick is presented for the first time in a complete form. Miss Nutting and Miss Dock have traced this branch of medicine from its earliest sources, to the present day, and have compiled in these two volumes a great deal of information which was only to be found in rare pamphlets and books in foreign languages, as well as in English. Their research work is to be praised, for it seems probable that nothing of value has escaped them. They have succeeded in finding records of nursing which long antedate the birth of Christ, in India, Egypt, and Greece, and have followed its story through Italy, Germany, France, Spain, England, and America. They have collected such a vast amount of information on the subject that they have had some difficulty in handling it, and this is the only essential defect to be found in this history, which will remain for a long time to come the standard work on the subject. The defect is not a serious one, and could easily be altered in a second edition—the work would be improved by some rearrangement of the chapters, and condensation. If this cannot be done, then the authors should write a brief history so that nurses and others may have the pleasure of owning an accurate history of their own profession; since this history is unfortunately beyond the means of many of them. It is impossible to distinguish accurately in the earlier times between nursing and the practice of medicine, so that in this history interesting accounts of medical practice occur frequently. The illustrations have been well chosen and are a revelation of conditions in hospitals which need no text to illuminate the horrors which existed in them. Nursing has often been practiced as a separate profession from medicine—that is there have been bodies of nurses who worked quite independently of hospitals and doctors, but the best nursing has developed in the last twenty-five years with the close union of training schools for nurses with hospitals, and the instruction of the nurses by the attending staffs. The greatest change that has come in "Nursing," however, is the practically complete elimination of the religious element which so long controlled and governed it, not alone in Europe but in Canada as well. Women no longer take up nursing from a religious impulse, but as an avocation and a means to earn a livelihood. The change is doubtless an advance in most respects but much admiration and very high respect is due to the "Sisters," who with an unparalleled waste of effort and strength have devoted their lives to the succor of the poor in a self-sacrificing way which no modern-trained nurse ever approaches. The present system has not yet reached its full development, and will probably go through many more changes before it is really well shaped, but while waiting for its final and highest development we may be well content with the stage it has reached in the past few years, which is in great part due to Miss Nutting. Miss Dock's name is also well known to all those who interest themselves in nursing problems, and there are no other women in this country who could have written such an accurate and at the same time interesting and entertaining account of Nursing.

It may be added for the information of those not acquainted with the latest developments in the life history of nurses that all nurses now graduated from the training schools have to pass special examinations to be permitted to practice their calling in any state and before they are permitted to attach the letters R. N. (registered nurse) to their names. R. N.

The Climatic Treatment of Children. By Frederick L. Wachenheim, M. D. (*New York: Rebman Company, 1907.*)

This little treatise should prove of particular value as a reference book to the practitioner. It covers more ground than its title indicates, for before taking up the climatic treatment of several groups of diseases, there is a brief but satisfactory review of the factors determining the nature of climate, such as temperature, humidity, cloudiness, rainfall, winds, atmospheric pressure, etc. Then follow two exceedingly valuable chapters, one on the climatology of temperate North America, and the other on that of various health resorts all over the civilized world. The facts adduced concerning the climate of the many regions mentioned are drawn directly from official records when possible, and are presented in a judicial manner and offer to the physician the data for the making of an intelligent choice as to the best available region for his patient.

Proceeding to the climatic management of the normal child and of its various constitutional and visceral diseases, the author has definite suggestions as to the proper kind of climate and the localities near and remote where atmospheric conditions desired are to be had. The experience at the many health resorts in Europe which have been much further developed than in America is freely drawn upon. Some repetition in this portion of the book is apparently necessary, as the climatic treatment of many affections is not dissimilar.

Withal the great value of pure fresh air and general rules of hygiene, irrespective of climate is sanely emphasized throughout the work. The author's opposition to the so-called "hardening" of children is to be approved of, as well as the general statement repeatedly made, that a rigorous or extremely cold climate is seldom desirable for young children, who thrive to best advantage in such places in which they can spend the greatest number of hours out of doors.

An earnest plea is made for the establishment of many more sanitaria in certain localities similar to those which have proved of such great service in Europe. The author's views on the utter futility and often harmfulness to young children of day excursions during the summer, as well as his plea that the stay of children in the various fresh air institutions should be determined by the condition of the patient, are noticed with great satisfaction.

The book is published with a number of maps, a short bibliography and a carefully arranged index by which the climate of any locality and that one suggested for a particular condition is readily indicated. J. H. M. K., Jr.

A Treatise on Plague. By W. J. Simpson, M. D., Aberd., F. R. C. P Lond., etc. (*Cambridge, Eng.: University Press, 1905.*)

This work which appeared two years ago has but just come to the reviewer who regrets that this important treatise is not better known to the medical profession. There is much in the book which would interest also the general reader. There are but few, except specialists in various lines who really have made a study of this disease, which from a sociological point of view is one of large importance. In this country undue excitement, and unmeasurable fear is aroused in the public by announcements from time to time of the appearance of a few sporadic cases. There is little reason to believe that plague will ever gain a real foothold in this country. But in India where the disease is pandemic, and exists all the time its ravages are far worse than those of tuberculosis, and its control is a question of vital significance to the British Empire. Dr. Simpson has devided his book into four parts: Part one, in three chapters, covers the history and distribution of the plague; part two, in eight chapters, is given over to the epidemiology of plague; part three, with five chapters, discusses plague in the individual; and part four, also with five chapters, considers measures for prevention and suppression of plague. There is also a valuable appendix which gives an account of the provisions adopted by the International Sanitary Convention of Paris, in 1893, to keep plague out of Europe. The volume is further furnished with maps, charts, and illustrations; and is an attractive example of the work of the University Press in bookmaking. "To all those who are actively interested in plague and its prevention, the author dedicates this work," and "to all those" it is warmly recommended. R. N.

Diseases of the Ear. By Hunter Tod, M. A., M. B. (Cantab.), F. R. C. S. (Eng.), Aural Surgeon to the London Hospital and Lecturer in Aural Surgery at the London Hospital Medical College. One of the "Oxford Medical Publication" series, published by Henry Frowde, and Hodder & Stoughton, London, 1907. Price, $1.50. (*New York: Oxford University Press.*)

This is the most satisfactory manual of otology that has appeared in recent years. It is concise, practical and "up to date," giving the undergraduate medical student just about what he needs and providing even the specialist with a hasty review of modern otology. While compact, it is very complete and not only is every aural topic set forth, but, it is done with such clearness and evident good sense that little more can be wished for. It is really a pleasure to read the book.

I commend it most heartily not only to the students but to all those interested in any subject of otology who want to get at the important facts with the least reading or delay. Questions of treatment upon which differences of opinion may honestly arise are here mentioned as debatable but the author's opinion set forth with a brief convincing argument.

The chapters relating to disease of the middle ear are, naturally, the most interesting and important; the necessity for prompt, early treatment to save life and hearing is well set out and the indications for operative treatment clearly given.

The illustrations are few and of little value; that and a few minor faults may readily be forgiven, however, in view of the general excellence of the book. H. O. R.

International Clinics. Vol. IV. Seventeenth Series. 1907. (*Philadelphia and London: J. B. Lippincott Company.*)

This volume contains numerous papers on treatment, medicine, surgery, gynæcology, etc., a few illustrated, as in the preceeding volumes of this publication, written by Americans and foreigners. The names of almost all the contributors are well known to the profession, and the success of these "Clinics" is due to the interesting papers which appear quarterly. In this volume two articles are worthy of especial note. Dr. Chantemasse's on "Five Years Experience with an Anti-typhoid Serum," and Dr. Calmette's on "The Ophthalmo-Reaction to Tuberculin." In this country Professor Chantemasse's success in treating typhoid is not as well known as it should be, nor has his treatment been studied here or elsewhere as it deserves to be. Dr. Calmette's work is well known to those who can read French, and this paper will greatly help those who cannot, to understand his new work, which may prove to be of great assistance, as a test for tuberculosis. It is very much to be regretted that this volume is defaced by advertisements which the publishers should not have used. It is unpleasant to find these in a volume which is otherwise to be praised, and it is to be hoped that the future volumes will contain no such

advertisements, which detract from its respectability. This is a matter on which it is hard to speak too strongly, and it is surprising that this firm should lower its reputation in this manner. R. N.

The Elements of the Science of Nutrition. By Graham Lusk, M. D. (*Philadelphia: W. B. Saunders & Company, 1907.*)

In the preface of this valuable work, the author states that his aim is to review the scientific substratum upon which rests the knowledge of nutrition both in health and disease. Furthermore, he hopes that the widespread interest in the subject of nutrition may cause his work to be of value to both the student of dietetics and the clinical physician.

In reviewing this work an attempt will be made to give only a brief idea of the subject matter contained in the three broad heads into which it may conveniently be divided: the dietetic, pathological, and theoretical sides. The treatment of the dietetic side is clear and simple. The foundations of the subject are elucidated in several interesting chapters, including discussions on "starvation." "the regulation of temperature," "the influence of proteid food," "the specific dynamic action of foodstuffs," "the influence of ingestion of fat," "the influence of mechanical work on metabolism," and "a normal diet." There is a wealth of information here, but only a few of the more important truths can be presented. For example, in dealing with the body regulations of heat, the author shows us that two sets of factors are concerned, those of chemical regulations acting by increased heat production, and those of physical regulation, acting by variation in the distribution of the blood and increased evaporation of water. Rubner's law, "that the metabolism depends on the amount of heat loss at the surface, and its variation in accordance with this law is necessary for the maintenance of a constant temperature" is discussed briefly.

The subject of nitrogenous equilibrium is fundamental in a consideration of the science of nutrition, and it is dealt with here in a very helpful way, containing a consideration of the effect of increased quantities of meat upon the gain and loss in body flesh and fat, as well as the respiratory quotient. The evidence that amino bodies resulting from certain proteolytic cleavages may be equivalent in the metabolism to ingested proteid itself is presented. The well-known work of Voit, v. Mehring, and Zunt upon the question of the production of fat from proteid is cited in brief.

Different food stuffs vary of course essentially in their dynamic action, and consequently in their effect on nutrition. Lusk we find sums up the influence of the three broad classes of food stuffs as follows: meat ingestion raises the metabolism most, fat next, and sugar least of all. The rivalry of carbohydrates and fats in the economy of nutrition has been an interesting one. The conclusion set forth in this work is that carbohydrates are the most economical of foodstuffs, both physiologically and financially, being the greatest sparers of protein.

Of what should a normal diet consist? This is a question about which both dietician and physician are concerned. Our author gives the original standard of 118 gm. protein, as laid down by Voit, together with the variations from this as exemplified in the dietaries of Rubner, Seven, Attwater, and Chittenden. Short tables of standard dietaries for a man of 70 kilos, as well as municipal food statistics, and hospital dietaries bring into a brief space much valuable information.

To the medical man the sections dealing with the metabolism of disease are most suggestive, and are prefaced as it were with interesting data bearing upon the food requirements during the period of growth. The energy content of cow's milk as compared with human milk is given concisely, and the relation of the growth of infants to their food suply contains much practical information.

Of the pathological conditions considered, anæmia, exophthalmic goitre, diabetes, fever, and gout form the most important, and only a few of the more salient points will be noted in each. Lusk points out that in anæmia the general oxidation of the body is normally maintained provided the disturbances are not of extreme intensity. In exophthalmic goitre there is an increased metabolism, as in a case cited by Friedreich Müller. A high destruction of fat and proteid is taking place, probably due to the toxic action of the thyroid secretion; while in myxœdema a reduced metabolism has been demonstrated. In the discussion of the metabolism in diabetes, the $\frac{D}{N}$ ratio is brought forcibly to the reader's attention, and urged as a method for the clinical examination of severe cases. It is normally 2.8. When, however, a diabetic is given a meat-fat diet, and the 24-hours urine of the second day collected, the discovery of 3.65 gm. of dextrose to 1 gm. of N signifies a complete intolerance for carbohydrates and probably a quickly fatal outcome. Lusk terms this the fatal ratio.

In the chapter on metabolism in fever are found many striking truths. The extreme loss of body proteid during high fever, and the problem of its prevention and replacement are surely of vital interest to the clinician. The lack of a suitable diet in many fevers, considered from the point of view of energy equivalent, is brought to the reader's attention. How critical nutrition may be in disease, we are reminded of, when we reflect that convalescence in such a disease as pneumonia does not commence with the temperature crisis, but the body proteid crisis, a period of about 4 days after the former, when the body begins to add on new protein.

A splendid review of the metabolism in gout is given. The work of Minkowski is quoted in epitomizing the modern knowledge on this subject and his suggestion that some organic compound may be found which will increase the solubility of uric acid or the oxidation of the same is stimulating to students of this disease.

The final chapter is given to a discussion of the theories of metabolism. The composition of protein, the possibility of amino acids being regenerated into protein are among the suggestive thoughts brought out. That the condition of proteid metabolism may be similar to that of starch metabolism (1, digestive hydrolysis; 2, partial combustion of end products; 3, possible regeneration of the end products into substances similar to the original, but characteristic of the organism, that is glycogen and body proteids) is offered by the author for consideration.

This work is an accurate and logical exposition of the science of nutrition. It is timely and should prove of great value to clinicians. In his preface the author states that if this work promotes interest in the laboratory methods to explain the inner processes in disease, his work will not have been in vain. It is hard to conceive how anyone could read this work and not be impressed by the extreme importance of laboratory study of disease, or fail to carry away some of the enthusism for scientific medicine that the author infuses into his work. The book is to be strongly recommended to all interested in medical progress.

Cosmetic Surgery. The correction of featural imperfections. By Charles C. Miller, M. D. 136 pages. 73 illustrations. $1.50. Published by the Author, 70 State St., Chicago, Ill.

This small octavo treatise with less than a hundred pages of text, and with illustrations of a poor quality can not be recommended. If an operation for cosmetic ends is to be performed, it should only be done by a very skilful surgeon of large experience, for such operations are among the most difficult from the point of view of successfully improving the features. Only a study of the work of the great surgeons who have described these delicate operations will help a young practitioner to overcome their difficulties. R. N.

Essentials of Modern Electro-Therapeutics. By Frederick Finch Strong, M. D. (*New York: Rebman Company, 1908.*)

Dr. Strong has tried in this work to furnish the medical profession with an "elementary text-book on the scientific therapeutic use of electricity and radiant energy," but has unfortunately failed. In a sense it is elementary, but it is hardly intelligible. It is absolutely impossible to describe "physiology from an electric standpoint" in six pages so as to be either useful or comprehensible. Although "electrons" might be considered "elements," they are surely not bodies which can be successfully treated in an elementary style. There are better books on electro-therapeutics—which are "Up to Date," and if not "simple" perhaps "simple" enough and surely "reliable" in spite of our author's views on the subject, and his style is really so bad, overladen as it is with capitals, that it is to be hoped the book will not fall into the hands of many students. R. N.

BOOKS RECEIVED.

A Manual of Clinical Diagnosis. By Means of Microscopic and Chemical Methods. By Charles E. Simon, B. A., M. D. Sixth edition, thoroughly revised. Illustrated with 177 engravings and 24 plates in colors. 1907. 8vo. 682 pages. Lea Brothers and Company, Philadelphia and New York.

Oxford Medical Publications. A Manual of Venereal Diseases. By Officers of the Royal Army Medical Corps. Introduction by Sir Alfred Keogh, K. C. B., Lieut.-Colonel C. H. Melville, R. A. M. C. Colonel Leishman, R. A. M. C. Major C. E. Pollock, R. A. M. C. 1907. 12mo. 282 pages. Henry Frowde, London. Hodder and Stoughton, London.

A Clinical Atlas. Variations of the Bones of the Hands and Feet. By Thomas Dwight, M. D., LL. D., 1907. 8vo. x + 24 pages. 36 plates. J. B. Lippincott Company, Philadelphia and London.

The Correction of Featural Imperfections. By Charles C. Miller, M. D. 1907. 16mo. 134 pages. Published by the Author, 70 State Street, Chicago.

A Text-Book of Minor Surgery. By Edward Milton Foote, A. M., M. D. Illustrated by four hundred and seven engravings from original drawings and photographs. 1908. 8vo. 752 pages. D. Appleton and Company, New York and London.

A Treatise on Plague. Dealing with the Historical, Epidemiological, Clinical, Therapeutic, and Preventive Aspects of the Disease. By W. J. Simpson, M. D., Aberd., F. R. C. P., Lond., D. P. H. Camb. 1905. 4to. 466 pages. University Press, Cambridge.

A Laboratory Manual of Invertebrate Zoölogy. By Gilman A. Drew, Ph. D. With the Aid of Members of the Zoölogical Staff of Instructors of the Marine Biological Laboratory. Woods Holl, Mass. 1907. 12mo. 201 pages. W. B. Saunders Company, Philadelphia and London.

International Clinics. A Quarterly of Illustrated Clinical Lectures and Especially Prepared Original Articles. Edited by W. T. Longcope, M. D. Volume IV. Seventeenth Series, 1907. 8vo. 308 pages. J. B. Lippincott Company, Philadelphia and London.

A History of Nursing. The Evolution of Nursing Systems from the Earliest Times to the Foundation of the First English and American Training Schools for Nurses. By M. Adelaide Nutting, R. N., and Lavinia L. Dock, R. N. In Two Volumes. Illustrated. 1907. 8vo. G. P. Putnam's Sons, New York and London.

Australasian Medical Congress. (Formerly the Intercolonial Medical Congress of Australasia.) Transactions of the seventh session held at Adelaide, September, 1905. Published under the direction of the Editorial Committee, South Australia. 1907. 8vo. 510 pages. C. E. Bristow, Adelaide.

A Very Young Ovum in Situ. By Prof. G. Leopold. Comprising the fourth volume of the "Arbeiten aus der Frauen Klinik in Dresden." With sixteen lithographic plates. Authorized English translation by W. H. Vogt, M. D. 1907. 4to. 69 pages. C. V. Mosby Co., St. Louis.

Light and X-Ray Treatment of Skin Diseases. By Malcolm Morris, F. R. C. S., Ed., and S. Ernest Dore, M. D., Cantab. With twelve plates. 1907. 12mo. 172 pages. W. T. Keener and Co., Chicago.

Diagnostics of the Diseases of Children. By Le Grand Kerr, M. D. Fully illustrated. 1907. 8vo. 542 pages. W. B. Saunders Company, Philadelphia and London.

Diseases of the Genito-Urinary Organs and the Kidney. By Robert Holmes Greene, A. M., M. D., and Harlow Brooks, M. D. With 292 illustrations. 1907. 8vo. 536 pages. W. B. Saunders Company, Philadelphia and London.

The Pancreas: Its Surgery and Pathology. By A. W. Mayo Robson, D. Sc. (Leeds), F. R. C. S. (Eng.) and P. J. Cammidge, M. B. (Lond.), D. P. H. (Camb.). Illustrated. 1907. 8vo. 546 pages. W. B. Saunders Company, Philadelphia and London.

Principles and Practice of Modern Otology. By John F. Barnhill, M. D., and Ernest de Wolfe Wales, B. S., M. D. With 305 original illustrations, many in colors. 1907. 8vo. 575 pages. W. B. Saunders Company, Philadelphia and London.

Atlas and Text-Book of Human Anatomy. By Dr. Johannes Sobotta. Edited, with additions, by J. Playfair McMurrich, A. M., Ph. D. Volume III. Vascular System, Lymphatic System, Nervous System, and Sense Organs. With 297 illustrations, mostly in colors. 1907. 8vo. 342 pages. W. B. Saunders Company, Philadelphia and London.

An Introduction to the Study of the Infant's Stool. By Paul Selter, M. D. The translation of a monograph entitled "Die Verwertung der Fæcesuntersuchung für die Diagnose und Therapie der Sauglings Darmkatarrh, nach Biedert." Translated by Herbert M. Rich, B. L., M. D. 1907. 4to. 28 pages. The Detroit Medical Journal Company, Detroit, Mich.

A Text-Book of Physiological Chemistry. By Charles E. Simon, B. A., M. D. Third edition, thoroughly revised. 1907. 8vo. 490 pages. Lea Brothers and Company, Philadelphia and New York.

Essentials of Modern Electro-Therapeutics. An Elementary Text-Book on the Scientific Therapeutic Use of Electricity and Radiant Energy. By Frederick Finch Strong, M. D. 1908. 8vo. 112 pages. Rebman Company, New York.

Rabies; Its Place Amongst Germ-Diseases, and its Origin in the Animal Kingdom. By David Sime, M. D. 1903. 8vo. 290 pages. University Press, Cambridge.

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CONTENTS.

	PAGE
Ophthalmovascular Choke. By George M. Gould, M. D.	101
On the Excretion of Hexamethylenamin (Urotropin) in the Bile and Pancreatic Juice. By S. J. Crowe.	109
A Satisfactory Pressure Bandage for the Leg. (Illustrated.) By John Staige Davis, M. D.	114
The Effect of Injected Leucocytes upon the Development of a Tuberculous Lesion. By Eugene L. Opie, M. D.	115
Proceedings of Societies. The Johns Hopkins Medical Society. Exhibition of Cases [Dr. Miller];—A Study of the Cases of Pneumonia Empyema occurring in the Johns Hopkins Hospital [Dr. McCrae];—A Clinical Study of the Alkalinity of the Blood [Dr. Strouse.]	116
Notes on New Books.	118
Books Received.	126

OPHTHALMOVASCULAR CHOKE.

By George M. Gould, M. D., Philadelphia.

For over 50 years many thousand oculists have been examining the eye-grounds of millions of patients with the ophthalmoscope, and in a certain large proportion of these patients these oculists have looked at several abnormal or morbid phenomena. But they have not seen that these things were morbid, and without an inquiry as to their significance they have been classed as physiologic, causeless, and resultless. For 20 years I had been as guilty of malobservation and thoughtlessness, but my excusing of myself is based upon the fact that I had supposed that these thousands of "scientific" men and "surgeons," would not have overlooked glaring, gross, and naked-eye abnormalisms, and that the significancies of the morbid facts, facts which were plainly seen of all, would have been set forth in all the text-books of 50 years. This is especially true when one thinks how long and avidly the entire ophthalmic world has sought for the etiology of glaucoma, pigmentary and atrophic degenerations of the retina, etc., which still remain vexatiously mysterious. A cause that lessens or shuts off the ingress or egress of the retinal blood-supply seems at once to solve the problems.

One of these facts is pulsation in the veins upon the nerve-head or papilla. Where else in the whole body is there a pulse-beat of veins? The fact itself is an abnormalism, and should have aroused instant suspicion, and a study of its possible significance. Its immediate cause was of course understood: the venous blood could only find exit between the beats of the arteries crowded against the veins. But why the crowding? And was not the diminished outflow itself morbid? And were there no resultant and secondary failures in nutrition, *i. e.*, impaired visual functions, etc.? These and like questions were not asked.

Another constant and daily revelation of the ophthalmoscope has been crossings and pressures and windings of the retinal arteries and veins under, over, and about each other, and, more rarely, even of a single trunk about or across itself. In many, perhaps the majority of such crossings, twistings, etc., the lumen of the vessel may not be lessened and the flow of blood either to or from the capillaries may not be patently hindered. But in a certain number of cases the underlying vessel is plainly flattened, even closed, and the caliber and size of the whole tube after the crossing strikingly lessened or almost extinguished. There follows the inevitable diminution of the amount of blood flowing by the constriction. Such phenomena, in default of a better name I have ventured to call "Ophthalmovascular Choke." It is of course a truism of physiology that perfection of physiologic function requires perfection of inflow and outflow of blood. The higher the function, the more complex the structure, the greater the necessity for a faultless blood-supply.

In a noteworthy physiologic study, by Dodge, of Visual Fixation, there are manifold accurate proofs that, speaking absolutely, any exact or persisting macular response to the

image-stimulus hardly exists. The study takes no note of pathologic conditions, but every expert oculist knows how much more striking is the shortness and inconstancy of visual fixation with eye-strain, amblyopia, inflammations, etc. I have elsewhere made a study of over a dozen mechanisms producing shadings of the retina, and which help to reestablish the sensitiveness impaired by too much light, by the overlong or even by a short exposure of the retinal sensitive plate, etc. It goes without saying that this easily exhausted sensitiveness will give way quicker if the full supply of fresh blood is lessened in any way. The false, blurred, or imperfect image of ametropia, of course, also increases the difficulty of the retinal labor. The sharp limits as regards the length of time of the response of the normal retinal function to the exposure of one image are quickly shortened or made morbid by many factors. The study and delimiting of these factors would, in truth, serve as a measure of the subnormality of general ocular function.

There is one symptom of subnormal retinal function which has been impressed upon my attention for many years. I have probably noted it in my case-records hundreds of times, but from apparent negligence I failed to recognize its true nature and amazing significance. From the first I have named it, *Fading Image*. Up to the last year I was so dull as not even to measure the length of time during which the image could be held, *i. e.*, the time from opening and fixation until the fading of the image or the failure of sensation began.

One further preliminary: Amblyopia *per se* may beget the symptom of "fading image"; but when visual acuteness has been retained; when perfect correction of ametropia has been secured; and when the plainest, most severe, and most direct symptoms of ocular malfunction persist; and especially when as sometimes they persist after other more severe local and systemic diseases have at once ceased with the wearing of scientific spectacles,—then, other diseases having been excluded, there must arise the suspicion of some more occult pathogenetic factor in the eyes themselves. Such, more or less, were the conditions existing in the ten cases I shall briefly describe. The manifest existence of eye-strain symptoms after perfect correction of ametropia, with "fading image," plus the equally manifest ophthalmoscopic demonstration of "Vascular Choke," brought to view a new disease, which I cannot help feeling is of too great frequency and significance.

Case I.[1]—For most of her life a highly intellectual and non-hysterical woman, 46 years of age, had suffered abominably from evident eye-strain. A number of the best oculists of the United States had failed to cure her with the best glasses and treatments they could suggest. The worst diagnoses and treatments (general paresis, said one brutally and erroneously), tenotomies and despair, the woman had wisely refused to illustrate or assent to. I was to be the last oculist consulted. But my glasses, etc., did no more good than those of my predecessors. At the first visit in using the opnthalmoscope I spoke of a curious loop in the superior temporal artery of the right eye. The patient said: "Oh, everybody has noticed that," but adding that it had no significance. The artery close to the disc turned upon itself, forming a circle about 10° in diameter, and passing under itself proceeded onward toward the macula. But in passing beneath the vessel was flattened by the pressure of the vessel about it, and from that point the artery was pale, half collapsed, and evidently carrying but a small quantity of blood. The macula was stippled and somewhat morbid in appearance, but otherwise the eye-ground seemed normal. My glasses had given no relief; there was a decided tendency to shut the right—the naturally dominant and important dextral eye—out of function; no device had given hope; the subnormality of accommodation of the right eye was about 1 D. greater than in the left eye—a significant fact; the amblyopia had not bettered under proper glasses; the symptoms, partly those due to eye-strain, were so peculiar as to arouse suspicion that more than ametropia was the matter,—such were the conditions which directed attention to the hitherto neglected looping of tne upper macular artery, and the plainly lessened blood-supply of the retinal area supplied by it. I at once ordered a blinder worn nearly constantly before this eye. A more certain test would have been a bandage, because, according to the physiologic law of imperative function, the right eye must struggle for life and dominancy during all the years it is dying. In a few weeks the report was that while there was not by any means complete comfort, there had been a decided lessening of the severity of the pain, etc. The most significant fact was this: While the blinder was worn there was comparative freedom from pain, etc., but when it was removed a throbbing pain came on, which did not disappear until the blinder had been worn again for an hour. I then knew my theory was correct and that there was nothing left but to exclude the ailing eye from function. A large black lens was provided to be worn absolutely constantly, and relief was soon secured. After a life of excruciating suffering the patient wrote (a year after first consulting me): "I am sure it will gratify you to know that my eyes are relatively comfortable; the blinder is a lasting success." Eloquent testimony to the reality of the suffering and also of the cure, is shown by the willingness and necessity of wearing the hideous blinder all the time.

Case II.—There had been failure of seven oculists, the last myself, to relieve a healthy strong young man of 20 years of age of "inability to use his eyes." His greatest complaint, upon persistent questioning, is that he becomes suddenly blind, or nearly so, when looking at anything. Things fade out and become nearly and wholly invisible. Even in the street, in looking at a person, the bodily figure grows dim or invisible; when playing baseball, and watching the course of the ball in the air, it will disappear for a second or more and then again become visible. In order to see anything plainly he has to rub his eyes. In near vision it is more impossible to hold the image. The peculiar and persistent blepharospasm for twelve years, with the rapid fading of the image, seemed to point to difficult holding of the retinal function due to faulty blood-supply. Competent general physicians had examined him and pronounced him free from all recognizable systemic or organic disease.

Having in mind the case above described, I was quick to recognize the existence in this man's eyes of the anomalies of the network of the retinal veins and arteries. From the point of emergence or entrance at the disc they curled about each other, crossed and recrossed each other, in a manner to strike immediate attention. Description would be almost impossible. The upper temporal artery of the right eye crosses over the vein on the disc, and crosses under the vein twice after leaving the disc. The lower temporal artery crosses over the vein on the disc and does not recover full size and color for 30° below the disc. The upper temporal artery of the left eye passes over the vein on the disc, again passes under the vein on the disc, and once more passes

[1] The first two of the following cases are epitomized from reports of my first article upon the subject in the *Medical Record* of June 1, 1907.

under the vein about 40° from the disc. The lower temporal artery passes beneath the vein on the disc, passes over the vein 20° from the disc; and again over the vein 40° from the disc. The arteries are smaller and thinner and lighter in color on the disc than toward the periphery, whereas the veins are turgid and swollen as they approach the disc. There was noteworthy general venous stasis, and venous pulsation was present. Both eyes were affected in the same way, but the right possibly in a more decided manner. I felt justified in ordering correct lenses, in explaining what I thought the cause of his symptoms, their incurability, and in urging a life-time renunciation of nearly all reading, writing, or near-work occupations. This advice was accepted, and after a year the reports are that the symptoms though somewhat improved still remain essentially as before, increased of course by "near-work" with the eyes.

Case III is that of the physician's wife reported in *American Medicine*, February 24, 1906, and included in Vol. V, *Biographic Clinics*, page 115. Up to the present time the woman has been as healthy and as happy as could be wished. There is not a trace of "neurasthenia," "hysteria," "retroversion," "exhaustion," backache, headache, etc. But one bothersome symptom was discovered after the complete re-establishment of the general health. It was not noticed earlier because near-work with the eyes was not undertaken. During the last year it has been found that reading, writing, or sewing at once produces waves of inability to hold the vision, or the image; "things fade out" when looked at for a few seconds, and there is a great "nervousness" when the task is persisted in. The patient is compelled to renounce. This symptom, indeed, has always existed, but it was hardly noticed because of the vastly greater and more multiform suffering, and also because "near work" with the eyes was not persisted in. Since recovery the natural desire to read, write, and sew, has become more imperative, and the inability to do so more noticeable and strange. The significance of the fact lies in the possible incidence of the symptom and the terrible results from use of the eyes in those who cannot, as can this woman, renounce labor with the eyes at near-range. Despite all attention to refraction, correction of subnormal accommodation, physical exercise, and other therapeutic advice and device the "fading image" persists. With continuous fixation of a letter or word, either at 20 feet or at 14 inches, it fades to nondiscrimination or nonvision in three or four seconds. This is with either eye alone, or both together. In reading, etc., the patient is compelled to move the gaze constantly from one object to another in order to keep on with any continuous work, and if the eyes are forced for a too long task, there is ocular pain, nervousness, evident injury, especially the next day, and then any use at all is impossible. The upper ophthalmic vein of the right eye passes under the artery at the disc, is engorged before reaching it, and empty, almost invisible, afterward. There are numerous other crossings, and venous pulsation is present. The crossings and pulsation are similar in the left. After massage of the eyeballs in the office the images were held for about two seconds longer than usual, but such massage carried out at home afterwards seemed to produce other symptoms such as headache, etc., and the patient would not go on with it.

Case IV is that of a young man of 25, whose eyes at ten were so bad that he "could not distinguish food and dishes upon the table." Headaches attributed to constipation, troubled as a child, and there were attacks of sick-headaches, without vomiting, with pain over the right eye, etc. He has noticed that he has had to look aside constantly for an instant in order to fix any object at all persistently. The fading-image symptom was verified. He was and remains naturally left-handed, but was taught to write with the right hand. There has long been noticed "blurring of vision" with near-use of the eyes. The eyes burn, insomnia is complained of, etc. Thinking the symptoms due to his uncorrected astigmatism I ordered B. E. + Cyl. 0.75 ax. 90° for constant use. My error was more excusable because of his amblyopia, which with the best lenses was 20/40 each eye, but more marked with the right eye. I found a vascular choking especially of the right, which kept me on my guard, and made me caution the patient that if the fading-image symptom persisted he should change his occupation to one demanding the least possible use of the eyes for near-work. This choking was manifest to me in a unique crossing of the upper ophthalmic vein of the right eye over the artery, in such a way that the vein rose over the artery in a sharp half-circle, like a letter n, the artery crowded beneath and within, and filling all the space. There was manifest choking and stasis. Similar conditions existed in the left eye, but less marked. There was long venous pulsation in both eyes, with congested and highly stippled maculas.

Case V is that of a woman of 34 whose clinical history consisted in "fading image" (spontaneously complained of), headaches, and many swooning or fainting attacks. She "had all the diseases of childhood," "remaining in a dark-room a long time," "a protracted attack of malaria," etc. Her general physician thought another long illness 15 years ago was a return of the "malarial infection," but she was cured at once by some glasses secured at the time, from a good refractionist of another city, and the "malaria" has never recurred. Whenever she did not use the glasses there was a recurrence of headaches. She has had many oculists and I found the last one had ordered R. + Cyl. 1.00 ax. 75°, L. + S. 0.50 + C. 0.50 ax. 90°, with + Sph. 1.00 added for near work. The headaches start in the eyes and extend to the occiput, have been particularly severe during the last year and a half, with nausea in the morning until she puts on her glasses. Feelings of nervousness, hurry, irritation, etc., were also complained of. She "faints away" on the least provocation. The swoonings began in late childhood, and she falls to the floor unless she hurriedly sits down when she feels them coming on. With proper correction of ametropia, the image fades in the right eye in three to four seconds. Early in the morning the image is held twice as long as after use of the eye during the day. The fading is "typical," *i. e.*, the image goes out entirely and returns completely. In the left the image is held longer and is a blurring and indistinctness rather than a full disappearance of the image. With both eyes the failing comes on in about eight seconds. Full clearness of the image recurs in about eight seconds. In the right eye there is venous pulsation, the superior ophthalmic vein passes under the artery, and afterward it is only one-half the size from this crossing until it enters the nerve. It is swollen and turgid before the crossing. There is no venous pulsation in the left, less venous clogging, seemingly because the vein passing under the artery just at the point of turning to enter the nerve, is not so much choked. While held, the visual acuteness of the right eye was at first only 20/40; after wearing glasses awhile it became nearly 20/20. The acuteness of the left was nearly normal from the first. The refraction error is:

R. + Cyl. 0.50 ax. 100°
L. + S. 0.37 + Cyl. 0.75 ax. 90°

Case VI is that of a robust young woman of 23, whose general health since renunciation of study, and near-work has been good. During the period of her most severe studying six or seven years ago she had a "nervous breakdown" (in the language of the lay-world,—"neurasthenia" in that of the Neurologs), and was compelled to leave school. At this time she was very "anemic," and had a score or more of "fainting spells," losing consciousness from 5 to 10 minutes at a time. Four years ago she got glasses, worn ever since:

R. + S. 1.75 + C. 1.00 ax. 90°
L. + S. 2.25 + C. 0.50 ax. 90°

Her static error I found to be:

R. + S. 2.50 + C. 1.75 ax. 85° = 20/30
L. + S. 2.75 + C. 1.00 ax. 95° = 20/20?
with good muscular balance.

With proper correction the object steadily gazed at, fades out in four seconds with the right eye, and with the left eye in six seconds, with both eyes in eight or nine seconds. She has long been conscious that she "couldn't hold the sight of things"; the symptom was worse before she got glasses, during her "breakdown," etc. It troubled her little when she wore her glasses, in after years, and was not noticed when she did not use her eyes in reading, writing, etc. Indeed it came to be her rule to wear the glasses only when the symptom became troublesome. Several months after her first visit to me and at her second visit it was as troublesome as ever, and the visual acuteness had deteriorated somewhat, because she had been wearing her glasses but little. Even then the fading image at this time would cease bothering her much whenever she resumed her spectacles. I found the vessels frequently intercrossed near and upon the discs, the lumens of those passing beneath flattened and in great part extinguished, the veins turgid, etc.; there was no marked venous pulsation.

Case VII is that of a woman of 30, in whom frontal headache began about 9 years ago. Two years later pain in the eyes was so severe that different parts of the body, the tongue, arms, etc., seemed as if paralyzed by it (the old story again!), and continuing until the only relief obtainable was by means of morphin. The pain at the first visit to me was chiefly at the backs of the eyes, but also in the temples, forehead, and back of the head. This was constant, she was never free from it, even in the night. Whenever she tries to use the eyes she has intense nausea and a "faint feeling," and can sleep at night only if she has not used her eyes at near-work during the day. Constipation has been severe. She has lived an out-of-door life, having neither read, written, or sewed for years. "Muscular rheumatism" (misnamed!) has existed from childhood, and photophobia and epiphora have been troublesome. She was wearing B. E. + S. 2.00 + C. 0.25 ax. 180°, and had been using glasses for about six years. Her static error I diagnosed:

R. + S. 2.00 + C. 0.37 ax. 180° = 20/20
L. + S. 2.00 + C. 0.25 ax. 180° = 20/20
with 12° of esophoria.

Her last oculist had advised tenotomy, but fortunately this was not accepted. Her general physician pronounced her disease to be "due to a neuropathic condition of the general system,—in a word a neurosis,"—the ancient modern naming of an unknown condition with a meaningless word. I ordered the above correction less 0.37, for constant use, and one year later there had been but little improvement. She lived far away and I begged her, unwisely as it proved, to have thorough examinations and treatment, by the best general physicians. But these had no good result, and, after having used and disused bifocal glasses for possible subnormal accommodation, I had her make another journey to me. By this time I was on the lookout, in such cases, for the fact, and the causes, of the fading-image symptom, and at once it was demonstrated. The refraction, etc., remained essentially as before. The main trunks of all the vessels passed over or under each other several times, but there was no venous pulse. The image of either eye alone could be held for three, or at most five seconds, and with both eyes for three seconds. With attempts to hold it longer the eyes filled with tears. Any jar makes the eyes throb, and stooping produces this at once. The blurring or fading seems like a pulse-wave that comes and goes. The image is not held better in the early morning. She raises her eyes and eyebrows constantly in attempting to look at anything. She finds she dare not go to church, theater, parties, etc. She has the curious and anomalous ability and habit, when attempting to "concentrate" or fix her gaze, of raising the right and lowering the left eye, at the same instant. Her local oculist, a skilled and conscientious man, thinks the trouble comes from the esophoria, but this cannot be when the image fades with either eye used singly. I shall not consent to tenotomy, although massage and other possible therapeutic measures seem useless. The rules of life and of practical living are clearly indicated.

Case VIII.—At my request this patient wrote the following: "All my life I have had headaches, 'nervous,' 'neuralgic,' 'bilious,' or 'sick.' As a young child I would have spells of semi-blindness, followed by the tense head-pain, and finally vomiting, exhaustion, sleep, and recovery. These attacks or others, have continued at intervals, ever since. Have had neuralgia (facial, head, and eye) also. Was known as a 'nervous, fidgety child,' given to outbursts of passionate anger, nervous terror, or violent weeping. For years I had throat trouble, 'tonsillitis,' and was a persistent somnambulist. When walking in my sleep I always executed any commands given me, and had the general air and appearance of one hypnotized. I was usually perfectly conscious—but powerless to control my actions—and was filled with a nameless terror, that usually ended in a paroxysm of weeping. These occurrences are now quite rare.

"From babyhood also, I have had attacks of losing my breath. My old nurse called it 'holding my breath' and said it was temper. (Possibly because strong emotion or violent feeling of any kind brings on such attacks.) I feel smothered, faint, gaspy, dizzy,—sometimes the sensation passes off in a few minutes, especially if I can reach open air, sometimes it continues until a state of partial unconsciousness results. I never fall—(save once or twice as a child after jumping rope) but frequently feel the floor rise or sway,—and have to catch something to steady myself. These seizures were especially frequent between the ages of twelve and fifteen, and eighteen and twenty (the latter a time of great grief, and worry and stress). I have also been subject to attacks of exhaustion somewhat similar to the above; sometimes combined with them, sometimes independent,—when the prominent symptom is complete collapse, inability to speak or move, and an intense desire for silence and solitude. These latter attacks have been conspicuously frequent of late.

"My hearing has for years been abnormally acute and abnormally irritable. The ticking of a clock is almost unendurable, the buzz of voices or any constant sound, however low, nearly drives me frantic. My father exhibited the same idiosyncrasy.

"All my life I have had a tendency to flushing, the blood beating in the temporal and jugular arteries so that the pulsations are plainly visible. At such times I feel strangled. Another prominent idiosyncrasy is an insatiable thirst, which has persisted since childhood. I drink quarts of water a day, and yet my mouth and throat are at times so dry that I speak with difficulty—(I have a natural lisp anyway, and as a child, stammered. I do so now when tired or excited). Of late this thirst has been even more pronounced, and I imbibe more water than ever. I seldom drink liquor or malt beverages, and can digest but little milk. My mother could not nurse me, cow's milk nearly killed me, so I was given to a healthy wet-nurse, and was weaned on goat's milk.

"My digestion is fairly normal, though I cannot and do not, indulge in rich meats, pastry, or greasy foods. I am a good sailor, seldom get sea-sick, but from childhood have been 'car-sick,' when riding on trains. It almost nauseates me to look down from a height.

"As a little girl I always winked, blinked or frowned in the sunlight, or any bright light. I had the usual children's diseases, plus two protracted attacks of malaria (never scarlet or typhoid) and the pronounced 'nervousness' previously chronicled. This

prevented any regular schooling until I was twelve years old, but I read insatiably all the time, in school or out.

"When sixteen or seventeen years old I developed an inflammation of the eyes which caused my mother to consult an oculist. He prescribed glasses 'for reading,' and for some time treated the eyelids with nitrate of silver. I wore these glasses for several years.

"In 1896, I developed insomnia, some digestional disturbance, and more than the usual number of attacks of faintness. The physician consulted prescribed digitalis, bromide of potassium, and hydrocloric acid (I think)—and change—I took up teaching at this time—my father's estate being hopelessly muddled, and worked and worried and grieved myself almost into collapse.

"For ten years thereafter I led a very strenuous life. I taught (part of the time both day and night), studied at the University afternoons, Saturdays, and summers, kept house, etc., and for several years there were troublous times. Prior to this, I had had a winter of eye-symptoms; went to Dr. ———, who tinkered a long time, and then to Dr. ———, who took great interest, was very kind, and seemed to help me. I consulted him at intervals for several years.

"During the summer of 1903, I attended a summer Art School, and on my return to school work in September broke down. I then developed insomnia, and numerous other nervous symptoms. I consulted Dr. ——— in September or October, 1903. The diagnosis was 'a case of nerves, due to strain and overwork, coupled with a strong hereditary, nervous tendency.' All winter I was harassed by an indescribable nausea, without vomiting, morning and afternoon. Dr. ——— finally decided it must be due to a uterine misplacement, which was found to exist, along with considerable congestion. I was treated for this for some time, and at intervals ever since; for the trouble returns whenever I fall from the physical high water mark. During the summer I recuperated—had little or no nausea, etc. On my return to the city in September I developed grippe,—and then in October started on a siege of morning nausea and evening vomiting which lasted till spring, and has left an apparently ineradicable tendency ever since. The nausea and vomiting was sandwiched in with attacks of faintness, headache, giddiness, irritability, insomnia, and uterine trouble, singly and together until summer and rest brought relief. For a long time Dr. ——— had ordered, entreated, cajoled me to leave school, for a while anyway. Accordingly I remained out from July, 1905, to February, 1906. There was improvement but not cure. The same old symptoms, modified, persisted less harrowing, and I had more time to recuperate in between. During this time my eyes failed again. For years I had heard oculists speak of 'spasm of accommodation.' I consulted Dr. ——— who found the 'spasm,' spoke of 'an interesting case,' and after a time decided there was rheumatism of the muscles (Dr. ——— had said the same) and directed Dr. ——— to give me some antirheumatic remedy. She had done this previously on her own account, but did so again. Eyes improved for a while. Resumed school duties in February, 1906, and again my woes began. In September, Dr. S. insisted on my taking a year's leave of absence. I did so, and remained under her supervision all winter. There was gain and improvement but not absolute cure. During June, 1907, I did constant writing and my eyes gave out utterly. It was then I first wrote you. This fall the principal trouble is headache, eyeache, nausea, flushing, faintness, smothering, and exhaustion, nervous irritability, and dread of sound, and an inability to read more than a few minutes at a time—coupled with intense dread of light,—especially electric. My head feels at times as though it were being crushed, and there is pain and sensation between the shoulder blades; and from there up to the head.

"Dr. ——— gave me another thorough examination last week. She says it is 'all nerves' and I must learn to help myself. My heart is in bad shape however (functional and not organic), and circulation is generally disturbed. 'There is a general tendency to congestion of all organs, a general functional impairment.' A urinalysis revealed 'no albumin,' but 'waste that should be there.' (Whatever that implies.) There is very slight uterine misplacement but 'pelvic organs are in better condition than ever before.' There is no insomnia, but on the contrary heavy sleep, broken with much dreaming, and general sleepiness all day. Dr. ——— has forbidden meat, tea, or stimulants of any kind; and advises plenty of fresh air, but 'little walking and no stair climbing for a while.'"

I was at first completely in error as regards the cause of this girl's many and real symptoms. She had had many different oculists who prescribed the worst possible lenses and I too hastily jumped to the conclusion that as in so many thousands her troubles were due to wrong glasses. The following were some of the corrections which had been ordered:

1. B. E. + Cyl. 0.75 ax. 90.
2. B. E. — Cyl. 1.00 ax. 180.
3. B. E. 1° Prisms, Bases in.
4. + Sph. 1.00 D for near work.
5. R. + S. 0.25 — Cyl. 1.75 ax. 175°.
   L. + S. 0.25 — Cyl. 1.50 ax. 15°.
6. R. + S. 0.50 — Cyl. 1.50 ax. 170°.
   L. + S. 0.50 — Cyl. 1.50 ax. 10°.

I found her static error to be:

R. — S. 0.12 + Cyl. 0.37 ax. 80° = 20/30.
L. + Cyl. 0.37 ax. 110° = 20/30. Orthophoria.

But this correction brought no more relief than did the ludicrously wrong ones, and a second visit some months later was required to learn that the bad corrections and no correction, although making the patient's symptoms worse, were not wholly at the bottom of the mischief. Fading and fluctuating image was the indication of the source of her misery. In about eight or ten seconds this extinction takes place with either eye, singly, and in about twelve seconds for both together. A few minutes reading brings on headache, and an unendurable irritability arises. Her photophobia is increasing, but she has never liked light, always wanted to get in shaded places, under low lights, etc. Even bright colors have always been disliked. The greater the illumination the quicker the image fades. Inquiry brings out the fact that she has known of this fading out of the thing looked at for seven years. The only good my glasses had done was to bring the visual acuteness for a few seconds at a time to normality. The ophthalmoscope showed strong venous pulse in the right, intercrossings of the vessels, turgidity of the veins, while the arteries were thin and pale. These conditions were not so marked in the left eye. By my advice the patient resigned her position, which required much reading and writing, as teacher, and for at least one year she is to stop all near-use of the eyes, live out of doors, etc.

Case IX is that of a highly educated nonhysterical nonneurotic woman aged 32, who was so unable to study as a child that she did not go to school until she was 13 years old. She came to me after consulting many oculists without relief for sick-headache,—"typical migraine," if there is such a disease. These attacks began about ten years ago, the crises of increasing headache, depression, vomiting, etc., occurring every few weeks. There were the usual old well-known accompanying symptoms of partial anesthesia, especially of the fingers of the left hand (Why is it always the left?) at the crises. She says: "Ordinary doctors called it neuritis or rheumatism but their remedies did no good, while upsetting my stomach." (This ancient nonsense-wisdom will survive, for how many generations? O Rheumatism and Neuritis, how many medical crimes are committed in your name!)

I was so hurried at the first visit that I failed to elicit the details of really more important symptoms, and as the "migraine" was the greatest complaint, and as that is the easiest curable of all diseases, I was the more readily negligent of the duty to get at all the details of past abnormalisms. All of her oculists had given her low spherical lenses alike in both eyes. One had been guilty of cutting the tendons of both interni. The "migraine," of course, continued. There has not been a sign of it since I ordered proper correction of the compound hyperopic astigmatism and subnormal accommodation, and the restored general health and happiness has been shown in an abundant gratitude. But in a few months came complaints by letters that reading, writing, etc., were almost as impossible as before, and a second journey again brought her to my office, when a more perfect case-history and a few tests brought a solution of the mystery.

During girlhood and in more recent years she has often swooned or fainted, sometimes losing consciousness, probably for considerable periods of time,—she was found, *e. g.*, on the floor by her sister in this condition during the night. She remembers now that as early as this, "objects disappeared from view" while looking at them. For instance, at church and while looking at the minister, she would find she could not see him,—"he faded out," etc. Her eyes are in constant movement, shifting, lifting, winking, etc. She has never analyzed or made definite this phenomenon, but for many years she has found that in reading she has to move the book about, constantly shifting it up or down, etc., indescribable dimness or indistinctnesses occurring all the time. This was especially necessary in studying German owing, as she discovered, to the formation and shapes of the letters. She remembers that when under the care of one oculist ten years ago "he was almost driven to distraction because she could not answer his questions." The test letters would be clear for an instant and then blur up. When I was testing her vision this was also painfully evident and as had long been habitual with me, I kept her closing the eyes every few seconds, and then by opening the eyes refixing the letters with the clearer vision gained by the darkening of the retina. She herself taught me a device whereby I could alone secure the proper discrimination: trying one 0.25 addition (or subtraction), or changing of the axis of astigmatism, by a glance at the letters, and after a second's closure, trying the reverse lens, or axis.

She has a long S spinal curvature, dorsoleft, lumbar right, with difficulty in bending the trunk to the left, with characteristic kinkings of the lumbar vertebræ, etc.

A peculiar photophobia has always existed and is so highly significant, and is so frequently present in these cases, that it deserves marked attention. Her symptoms have all been worse in summer, and any sunlight, glare, or brilliant artificial light, has been repugnant and if not avoided, brought on pain in the eyes, or headache. She has exceptionally large pupils and her husband has noticed that their increased dilatation is a "danger signal" preceding headache, etc. The pain in the eyes, usually the left, has been at once lessened or stopped by darkness or wearing a blinder. She can see better in a dim light; she has kept the lights turned low in her rooms at night, and has always read with the shadow of her head, etc., on the book. She has long had her room heavily shaded, papered with dark wall-papers, etc.

Many tests, each made after closure of the lids, show that the image of a test-letter is held about four seconds with the right eye, and three with the left, and with both together only about four.

At the first visit I made doubly emphatic notes of the existence of very small and pale retinal arteries and capillaries, but at the second visit I saw why this was so. There were abnormally numerous crossings of the vessels, on and near the discs, the threadlike arteries lying almost always beneath the relatively overfilled veins. There was no venous pulse. It was evident that the maculæ and adjacent regions were very poorly supplied with arterial blood. In spite of all this the visual acuteness was for two or three seconds perfect. There was almost no change in the refraction-error between the first and second visits.

It was plain to me and I made it so to the patient that there must be as nearly a perfect renunciation as possible of reading, writing, sewing, etc. Fortunately, although pitifully against taste and habit, this is possible. Had she been a seamstress, clerk, teacher, etc., the tragedy would have been far greater.

Case X.—Nineteen years ago I prescribed spectacles for a young man with the desired relief of headaches, etc.; but ever since there have been puzzling continuances and recurrences of other symptoms I had supposed due to eye-strain. All the changes and devices I could suggest have never been satisfactory either to myself or my patient. Even before I had recognized the significance of the symptoms of venous pulse, fading images, etc., before I had supposed they had any significance, I had noticed "fluctuating images," variable refraction, inexplainable amblyopia, with return of normal acuteness, switching of axes, "asthenopia," an alarming development of myopia, followed by a speedy recovery from it, etc. The headaches I had long been able to conquer, but not these other symptoms. In all such cases I have been habited to send for the patients to whom I had failed to give satisfaction in order to re-examine the refraction, to test for subnormal accommodation (this patient had it), to look for spinal curvature, secure urinalyses, etc. All of which in this case were resultless. So when I had got a clear idea of Ophthalmo-vascular Choke, I at once sent for this man. It took only a few minutes to find what I had so long overlooked—all the distinctive symptoms of the disease conjoined. The image faded out in three or four seconds with either eye or with both together; there was frequent constant closing, "batting" or "blinking" of the lids,—more decisively and longer held than in winking; rubbing of the eyes, "watering" of the same, photophobia, etc.; there was inability to read or write but a very short time and that with discomfort and "nervousness," or tiring; and there was the necessity of constant movements of the book, etc. Another symptom was new and startlingly suggestive: if reading was forced the book was held to the right side, and finally so far, that the left eye could not see the page; only the nasal side of the right retina was then used, and the macula region was disused. A glance with the ophthalmoscope made it all clear,—there were the unmistakable proofs of vascular choking. The veins were highly distended, and overfilled with dark blood, and there was a long and labored venous pulsation in both eyes. The crossings over each other of the vessels, on and near the discs, and sharp bendings showed sufficiently numerous and severe obstructions to the flow of the venous blood, to account for the symptoms even without the venous pulses or retrobulbar choking. This patient's circumstances were such that he could follow the advice to do no "near-work," at least for a while. I had not the heart to tell him of my belief that he would never be able to read much or any.

These findings, taken as a whole, seem to me to constitute a new and clearly-defined type of ophthalmic disease; to throw a flood of light into the pathogenesis of many ocular diseases hitherto seemingly unrelated, and of unknown origin; to differentiate a source of eye-strain until now unsuspected; and to explain a large number of vague but still most real systemic "nervous" and mental disorders. As is well understood, the higher, more complex, more neurologic or cerebral the function the greater must be the supply of fresh blood, the more imperative the necessity for quick elimination of the venous blood. Slight denutrition is decidedly weakening,

and much of it is fatal. Nowhere can it be more harmful than to the astonishingly complex and highly differentiated tissues of the macula region of the eye. At its best and most perfect these parts are with difficulty fed by the nearby but not entering capillaries. Not to be overlooked is the fact also that the function of the rods and cones here is in such an amazing state of unstable equilibrium and has to respond to a force millions of millions times more slight, for instance than the ear.

The anatomic and physiologic mechanism of the macular blood-supply is moreover subject to noteworthy difficulties and dangers. If in spraying one's lawn the hose gets curved upon itself the "pressure" or supply of water is lessened. In animals with divergent axes of vision of the two eyes there is not the curving of the retrobulbar optic nerves as in man. With him there is for the first time in evolution not only parallelism of the axes, but in a "near-worker" there is actual and habitual convergence. The greater the approach to parallelism the greater the curving of the optic nerves, and the more convergent the axes, the more the reading, writing, etc., done, the higher is the curve of the orbital portion of the optic nerve. Supposing that when straight, the retinal vessels within the optic nerve had plenty of room, it is evident that their lumens would prevent free transmission of the blood just in proportion to the degree of the neural bending or curvation. It is possible that this cause may act in this way to lessen the proper income and outgo of the two kinds of blood.

But when one thinks of the size of the optic nerve made up of 425,000 strands of insulated fibers it is seen that the vascular trunks in the center of these fibers have little enough room for the blood to pass freely, and that the least crowding may readily interfere with it. Venous pulsation, heretofore considered as wholly without significance, is however an abnormalism, is evidence of a function which either is or may be in itself pathologic. It is plainly a demonstration of "choke," showing that the outflow of venous blood from the eye-ball is irregular and difficult. It is, I suspect, due to crowding of the vessels in the optic nerve and may therefore be differentiated as *retrobulbar choke*. That the retinal infrabulbar arteries have no pulse-beat seems in itself proof of some vascular compression in the nerve, and an added one is the fact that sometimes the venous blood can escape only between the posteriorly placed beats of the artery.

Infrabulbar choke may possibly be a simple or secondary consequence of retrobulbar choke, through the added pressure in the arterial blood columns to force an entrance, and through the resultant venous turgidity and impeded outflow of the venous blood. But if there is a plainly added pathogenetic factor easily demonstrable by the ophthalmoscope, and, from the evolutionary history and from the physiology of the eye, most likely to occur, then we have a doubling of two possible pathogenetic agencies which will easily become really denutritional and disease-producing. Such a cause is that found in the ten cases above reported,—crossing of the vessels over or under each other, with resultant impeding of the flow of the blood-currents.

The pecten, and the shading mechanisms of the retina must be considered to make clear how and why these infrabulbar chokings have arisen. I do not know that any one has suggested a function or *raison d'être* for the pecten in birds. It could scarcely be a "mistake of Nature," or a mere curiosity for a true scientific man. The danger to the retina of man from direct exposure to the sun's rays is of course well known. Even as little as he need to expose his eyes to these rays in the labors, games, or wars of life, Nature has found it necessary to supply the retina with more than a dozen distinct, ingenious, and differing mechanisms elsewhere described by me, for shading the retinas. But in animals by their habits necessarily exposing the retinas to the danger of direct sunlight, some of these mechanisms do not exist, and all would, in the birds, be insufficient to prevent retinal injuries from this source. Waving about freely and extensively in front of so large portions of the funduses of the eyes of birds the pecten admirably serves as an ever-moving and protecting curtain. The constant motion of the head and eyes keeps up the alternate shading and exposure of the retinas that is required. Anatomically it is a loose mass of blood-vessels. In the higher vertebrates and man it is not needed, and, as it were, becomes thinned and flattened out forming the fixed single layer or network of arteries and veins, thus giving more extended areas of functional retina; and other shading mechanisms have also replaced it in function. In this retrenchment, flattening, and immobilizing process, and aided by other evident factors, it is but natural that intervascular crossings should occur with resultant pressure on the underlying vessel, diminution of its lumen, impeded flow of blood, etc.,—in a word, what I have called "infrabulbar choke." When the functional interference may become pathogenic and beget morbid denutrition of the difficultly nourished macula, is a question purely of circumstance, condition, and clinical demonstration. The *fading image* appears a natural consequence and symptom, and once put on our guard and made watchful for it, its clinical appearance is easily recognized, and of far-reaching significance.

Some practical lessons and cautions may be gleaned even from these ten cases: The fading image in each eye singly, demonstrates that it is not due to muscular imbalance, and a number of other tests make this clearer; one must be on his guard against confounding this symptom with that due to long-continued eye-strain, from uncorrected, or what is worse perhaps, badly corrected ametropia. In amblyopia *per se* the symptom may be found or rather simulated, but is easily differentiated if care is exercised and the entire case-history is meticulously followed and coordinated with the existing symptom-complex. There is no excuse for the lessening of the exquisite care and conscientiousness required to eliminate the more frequent and common eye-strain, for proper glasses usually lessen the evils of the vascular denutrition, and relieve the symptoms heretofore ascribed to it, while, also, that may be the sole means of making life happier and possibly endurable; subnormal accommodation must also be looked sharply after, and solicitously excluded or allowed for; the

time required for the fading must be measured for each eye singly and for both together, and the results compared with the usually corresponding anatomic and functional conditions as shown by the ophthalmoscopic examination of each eye-ground,—for, as everywhere else, and particularly here, there is no "typical case," individualism being peculiarly emphasized in this disease; in conjunction with the fading image, the existence of objectively observable vascular choking, and more surely if with venous pulsation, there can be little doubt of the existence of this sad disease. Two profoundly suggestive symptoms may have been overlooked in some of the foregoing cases in which I have failed in the recording, but that swoonings or fainting attacks were strangely marked in five, and a notably peculiar photophobia in two, arrests the attention. They are natural results of the deficiency of blood-supply to the macular regions. The effect of this disease upon the cerebral and mental processes, upon the disposition, the occupation, upon a host of evervarying conditions called "nervous," upon "hysteria," "neurasthenia," and the like, is startling in illumination. The transcendent importance of clear and healthy vision to the success and happiness of life should be unquestioned. A cause that cuts it off or impairs it every few seconds is of vast import. The function of vision, never to be renounced, ailing and fluctuating every minute, never to be cured or even understood, add elements of pitiless mystery and despair aptly fitted to induce psychic disease or neurologic morbidity. The inane and fatuous explanations so fashionable with neurologists, "neuropathic tendency," "heredity," "autotoxemia," etc., will not be ended perhaps for a generation, but the study of such cases as these should with genuine clinical knowledge sign their death-certificates in 24 hours—at least so far as pertains to patients with eyestrain or ophthalmovascular choke.

May not this disease explain some or many cases of the development of acute myopia? It supplies the precise condition which would seem required. And of otherwise mysterious and sudden changes in the amounts of myopia, or in the axes of astigmatism?

Just in proportion as the various single symptoms and signs mentioned are united with others, just in proportion to the number conjoined in a single case, will the disease approach "typicality." In order of their importance these may be enumerated as:

Subjective.

1. The fading image,—according to the number of seconds the image is held, with each eye singly, and with both co-operating.

2. Inability, with all the best ametropic corrections, to read, write, sew, etc., except for an abnormally limited time.

3. Constant changes required in the position of the book, paper, etc., with frequent looking away from it, ceaseless ocular movements, and even reading with some extramacular portion of the retina.

4. Exaggerated winking, approaching blepharospasm, the necessity of rubbing the eyes, etc.

5. Photophobia, conjunctival hyperemia, smarting, sensitiveness, excess of tears, etc.

6. "Nervousness," restlessness, with many, often vague, psychic, and cerebral symptoms, becoming under circumstances more severe and indescribable or even "hysterical."

7. The existence of one or more of these subjective symptoms in one eye, or in both, in conjunction with a corresponding degree of objective vascular choking.

8. Unaccountable refraction-changes, the acute development of myopia, etc.

Objective.

1. The existence of such crossings, crowdings, obstructions, sharp turns, etc., of the vessels, on or near the discs, as may prevent the free passage of arterial blood to the macular region, or of the venous blood out of the eye.

2. Abnormally enlarged and engorged veins, or abnormally small or thin arteries.

3. Vessels manifestly collapsed, or partially empty after such crossings, obstructions, crowdings, or chokings, in the direction of the blood-currents.

4. Venous pulsation.

5. Abnormal stippling, or pigmentary changes at or about the macula, not to be accounted for by other causes.

The prognosis, it must be admitted is not the brightest, but several important things may be said of it:

1. We know nothing about what changes or modifications in the disease are wrought by presbyopia, which, as it lessens the intraocular pressure, switching plus astigmatic axes to 180, etc., may bring lessening of the choking. Massage of the globes of the eyes does not seem of much avail. I am going to try the effect of long-continued instillations of weak eserin solutions.

2. Most patients require nothing more than abstention from reading, writing, etc., to secure comparative comfort and happiness.

3. The recognition of the inobviable commands of fate and limits of circumstances is infinitely better than the fright and horror of a fatality, whose nature is unknown, and beyond forecast of how, when, or where, it will strike.

4. On the part of the patient the recognition makes definite and orderly the direction of the life, whereas at present how many thousands are wandering from doctor to doctor, from sanitarium to sanitarium, now filled with hope then in the misery of despair, never well and never dying. With this knowledge the plagued patient may learn the essence of all life-wisdom—to make a friend of fate, *i. e.*, to learn the uses of his limitations, and to stop banging his head against the walls of destiny.

5. On the part of the profession it would be far better to know the real source of the suffering of so many patients, now dubbed by a dozen silly words, "toxemia," "neurasthenia," "hysteria," "invalidism," "break-down," "neuropathic diathesis," etc. Those physicians may be checked who are deluding these victims throughout their pitiful lives, knowing medicine cannot cure, but knowing as well that the patient

can pay well for the delusion that medicine will cure. On the part of the conscientious physician or oculist, it is better to know what is the cause of the nagging mystery, to know at least that it is not due to improper glasses, muscle imbalance, or the need of Mrs. Eddy.

6. The "cures" of Mrs. Eddy and the faithcurists, are often seemingly real, because the diseases cured are often due to eye-strain, and ophthalmovascular choke. When the cure is apparently real, it is because reading, writing, etc., are stopped. Intellect and literature are not needed by the Eddyite.

Ophthalmic vascular choke, if so much is admitted and becomes established, may be found to constitute the etiologic factor, or at least a frequent and chief one, in the rise of many ocular diseases now veiled in mystery. It is remarkable that we are in more or less complete ignorance of the origin of so large a number of the principal intraocular diseases. The pathogenesis of most, in truth, is either unknown, or erroneously ascribed to vague and non-explaining conditions. Take all the entire classes of diseases characterized by pigmentary and atrophic degeneration of the retina both central and peripheral; they are preceded usually by stages of acute inflammatory processes, followed by atrophies precisely as one would expect to find in a shutting off of the normal blood-supply. There are islets of preserved retinal sensibility; the central or macular portions may keep their function better, or the peripheral ones may do so; the normal central acuteness may be well or poorly sustained, etc., according to the circumstances and accidents of the nature of the choking; or, as in our cases, the sensibility may be retained more or less perfectly but only for abnormally short spaces of time. I suspect that in most or all of the cases by the anatomic pathologists called retinal arteriosclerosis, ophthalmovascular choke is the real disease instead of primary sclerotic changes in the vessel-walls.

That elder choking called *choked disc,* together with many mysterious cases of optic atrophy,—may not these and many retinitises be caused by a bad blood-supply, or, what is the same thing, a deficient blood excretion? The great mystery of the origin of glaucoma may be at last resolved by weighing well the natural and inevitable consequences of vascular choke. The ludicrous inadequacy and ineptitude of the text-book etiologies of glaucoma, illustrate—well, they illustrate "much." Exophthalmic goiter with its chief symptoms, tachycardia and exophthalmos, may possibly have a primary, or at least a cooperating cause in the denutrition and abnormalisms of secretion following a deficient blood-circulation of the internal parts of the eye.

ON THE EXCRETION OF HEXAMETHYLENAMIN[1] (UROTROPIN) IN THE BILE AND PANCREATIC JUICE.

By S. J. Crowe.

(*From the Pharmacological Laboratory of the Johns Hopkins University.*)

Several investigators have studied the excretion of substances in the bile. Mosler (1) in 1857 showed that both cane-sugar and glucose pass into the bile, the former more readily than the latter. He showed furthermore, that potassium iodide readily passes into the bile, but soon disappears; while quinine sulphate and benzoic acid do not appear in this secretion.

Meder (2) from his studies in 1892 concluded that practically all substances which are absorbed pass more or less readily into the bile; among them potassium iodide, potassium bromide, and mercuric chloride. On the other hand, according to his investigations, potassium nitrate, morphine, and quinine salts are not so excreted.

Vieillard (3) studied the excretions of a large number of drugs through the bile, and concluded that certain substances augment its antiseptic power, the best of these being sodium salicylate, salol, and mercuric chloride. He reported in his thesis in 1895 a number of cases of acute gall-bladder infections treated with sodium salicylate; he found that the drug lowered the temperature, relieved the pain, and not only stimulated the secretion of bile, but also rendered it antiseptic to a slight degree. Linnossier (4) however, in 1901 failed to support this observation, for he showed that dogs receiving two grams of sodium salicylate by mouth never had enough excreted in the bile to exercise any appreciable bactericidal action.

So far as we have been able to learn, the only substance which has been definitely shown to be excreted by the pancreatic juice is potassium iodide (5).

The present investigation was undertaken by reason of a suggestion made by Professor L. F. Barker in regard to chronic carriers of typhoid bacilli in the gall-bladder. The value of possessing a drug which would exercise its antiseptic action in the biliary passages has long been recognized, and that it has been searched for is indicated by some of the above citations. Thus Herter (6) in 1905 pointed out the importance of finding an antiseptic for preventing and combating infections of the bile passages.

Hexamethylenamin was suggested by Dr. A. S. Loevenhart as a substance which would deserve study for the following reasons:

[1] This term is applied to the condensation product (Hexamethylentetramin, $(CH_2)_6N_4$), obtained by the action of ammonia upon formaldehyde.

1. Because it is already in common use during typhoid fever in cases in which bacilluria occurs.

2. Because its presence can be readily determined chemically.

This drug was first prepared in 1860 by Butlerow (7) and is made by the action of ammonia on formaldehyde according to the following equation: $4NH_3 + 6HCHO \leftrightarrows (CH_2)_6N_4 + 6H_2O$.

Hexamethylenamin is readily hydrolized on boiling with dilute acids, yielding formaldehyde and ammonia. Even in neutral aqueous solutions it undergoes this decomposition to a certain extent when heated above 50° C., and for this reason we have indicated in the above equation that the reaction is a reversible one. The equilibrium point certainly varies with the temperature and the reaction of the solution, and will probably be found to vary also in different organic mixtures and body fluids.

Hexamethylenamin was introduced into therapeutics in 1894 by Nicolaier (8) under the name of urotropin. It is rapidly excreted through the kidneys and has come into general use in infections of the genito-urinary tract. Richardson (9) in 1899 showed this drug to be an efficient urinary antiseptic in typhoid fever, and recommended that it be given to all typhoid patients, 30 gr. daily for 10 days, beginning with the third or fourth week of the disease. Churchman (10) made a bacteriological study of the urine before and after giving urotropin, helmitol, and methylene blue, and concluded that, of these drugs, urotropin is the most efficient. He found that there are certain organisms, however, which are very resistant to its action in the urine. Staph. aureus proved to be the most resistant; while B. typhosus and S. pyogenes disappear under its influence in most cases.

In addition to its value as a genito-urinary antiseptic, our experimental findings indicate that hexamethylenamin will probably be of efficiency in the following conditions:

1. Acute infections of the gall-bladder.

2. Convalescence from typhoid fever, where the advantage would be two-fold: (a) As a prophylactic measure against the subsequent formation of gall-stones; and more important (b) by sterilizing the gall-bladder and thus preventing the patient from becoming a chronic bacillus carrier (11), a menace to his community.

3. Before gall-bladder operations, as a prophylactic measure.

The methods employed in our work were as follows: The excretion of hexamethylenamin in the bile and pancreatic juice of dogs was determined in the following manner. After exposure of the duodenum, an opening was made about 3 cm. below the pylorus. This incision exposes the orifices of the pancreatic and common bile ducts, which in the case of dogs open separately. After the intravenous injection of secretin, the bile and pancreatic juice were collected by means of small catheters inserted into the ducts.

A slight modification of Hehner's test was used to determine the presence of hexamethylenamin. This test was made as follows: 4 to 6 drops of milk are added to a few cubic centimeters of the material to be tested, and this mixture is stratified with an equal volume of the reagent, which is composed of 100 cc. of 99 per cent sulphuric acid and 1 drop of a 3 per cent ferric chloride solution. The sulphuric acid decomposes the hexamethylenamin into formaldehyde and ammonia, and a deep amethyst color develops at the juncture of the layers. If formaldehyde (hexamethylenamin) is present in too great a concentration, however, no color develops. The deep color of the bile necessarily interferes with tinctorial tests. A portion of the bile is therefore diluted with water, acidified with sulphuric acid and distilled. The formaldehyde passes over in the distillate to which the test can be readily applied. In the case of pancreatic juice, or any other colorless solution, the test can be applied directly. Casein can be substituted for milk in this reaction, in which case the aqueous layer and the sulphuric acid can be mixed. The heat which develops serves to accelerate the reaction, and the amethyst color is diffused throughout the mixture.

The experiments on dogs all showed that hexamethylenamin is excreted in the bile and pancreatic juice. In one case it was found to be present in the bile contained in the gall bladder 24 hours after giving 1 gm. of hexamethylenamin by mouth, and it could also be demonstrated in the pancreatic juice obtained under the action of secretin. The pancreatic juice collected from an animal that had received 1 gm. of hexamethylenamin by mouth and 3 gm. intravenously, was roughly estimated by colorimetric comparison to contain a quantity of the drug equivalent to a 1:10,000 solution of formaldehyde. In making this estimate, the color given by the pancreatic juice was compared with that given by a known solution of formaldehyde.

In order to determine whether any of the hexamethylenamin present was excreted directly through the wall of the gall-bladder, we exposed and ligated the cystic duct. Within the next two hours, 3 gm. of hexamethylenamin were injected into the femoral vein, and the bile escaping through the common duct was collected by means of a catheter. At the end of this time the gall-bladder was removed, and the bile contained in it, as well as that discharged from the common duct, was distilled and tested in the usual way. Hexamethylenamin was found to be present in considerable quantities in both specimens and apparently the bile from the gall-bladder contained more than that which had been discharged through the common duct. This experiment indicated that hexamethylenamin is excreted directly by the gall-bladder, as well as by the hepatic cells. The milk and saliva of these dogs also gave the test. The excretion of hexamethylenamin in the milk of human beings has been observed by Bucura (12).

As shown by the following experiment, hexamethylenamin is rapidly absorbed and remains in the circulating blood for some hours. A rabbit was given 0.5 gm. of hexamethylenamin by mouth and 15 minutes later about 1 cc. of blood removed from an ear vein gave a decisive test. As with the bile, the test cannot be applied directly to the blood. The blood is diluted with water, acidified with sulphuric acid, distilled,

and the distillate tested for formaldehyde. A faint trace was still present in the blood removed 24 hours after giving the drug.

The results of these experiments may be briefly stated as follows:

1. Hexamethylenamin when administered by mouth is rapidly absorbed and remains in the circulating blood for 24 hours. Apparently the maximum concentration in the blood is reached in 5 to 8 hours after giving the drug.

2. It is excreted in the bile, pancreatic juice, and directly through the wall of the gall-bladder in dogs.

3. It was found to be present in the saliva and milk of dogs after the intravenous administration of 1 gm.

In view of the experimental findings in animals, it was determined to make a bacteriological and chemical study of the bile obtained from patients with biliary fistula, before and after giving hexamethylenamin.

The following are the results obtained from the few cases that we have so far been able to follow:

Case 1.—In Dr. Kelly's service, Johns Hopkins Hospital.

Mrs. B., aged 45, was admitted for some pelvic trouble. During the routine exploration at the time of the operation, the gall-bladder was discovered to be distended with gall-stones. A second incision was made and 45 small gall-stones, together with a large amount of sandy, mucoid material were removed, and a biliary fistula made. No cultures were obtained from the gall-bladder at the time of operation, but ten days later, plates inoculated with the material aspirated from the sinus gave the following results:

Table I.

	Inoculated with	Estimated No. of Colonies after 24 hours.	Organisms present.
Plate I	1 loop bile	1,200	B. typhosus, B. pyocyaneus, and other organisms not determined.
Plate II	3 " "	4,000	
Plate III	5 " "	8,000	

Immediately after making these cultures, the patient received her first dose of hexamethylenamin. Within the next 24 hours there was administered to her 5 doses of 15 gr. each, or a total of 75 gr. Four hours after the last dose, a second portion of the material was aspirated from the sinus and plates were inoculated as before (Table II).

Table II.

	Inoculated with	After 24 hours incubation.	
Plate I	1 loop bile	No growth	Plates remained sterile after 4 days' incubation.
Plate II	3 " "	" "	
Plate III	5 " "	" "	

Some of the material obtained from the sinus was diluted with water, acidified, and distilled, as above described. The distillate gave a positive test, showing that either hexamethylenamin or its decomposition product, formaldehyde, was present in the bile in considerable quantity.

Especial interest attaches to this case because of:

1st, the finding of gall-stones.

2d, the isolation of the typhoid bacillus, in the absence of any history of typhoid fever;

3d, the rapid disappearance of the typhoid bacillus, together with the other organisms present, after the administration of 75 gr. of hexamethylenamin by mouth.

Case II.—In Dr. Finney's service at the Union Protestant Infirmary.

The patient was 52 years of age, and was suffering from intermittent attacks of jaundice of several years' duration. No gall-stones were found at the operation, but a biliary fistula was made in order to relieve the jaundice. A portion of the bile was aspirated from the sinus on the tenth day after operation, and plates were inoculated as in the above case.

Table III.—Before Giving Hexamethylenamin.

	Inoculated with	Estimated No. of Colonies after 24 hours.	Organisms.
Plate I	1 loop bile	6,000	B. coli, large cocci, and probably air organisms.
Plate II	3 " "	12,000	
Plate III	5 " "	20,000	

This patient was also given 75 gr. of hexamethylenamin within the next 24 hours (Table IV), at the end of which time cultures were again made from the bile discharging through the sinus.

Table IV.

	Inoculated with	Estimated No. of Colonies after 24 hours.	Organisms.
Plate I	1 loop bile	40	B. coli only was found to be present.
Plate II	3 " "	75	
Plate III	5 " "	90	
Plate IV	1 cc. "	500	

The effect on the number of organisms here is quite interesting when compared with Case I. The B. typhosus present in the first case rapidly disappeared under the influence of 75 gr. of hexamethylenamin, while in this case a few colonies of B. coli persisted. The other organisms present rapidly disappeared. No further observations were made on this case.

Case III.—In Dr. Halsted's service at the Johns Hopkins Hospital.

The patient was 48 years of age, and admitted for severe attacks of abdominal pain, associated with jaundice. A single gall-stone was found in the gall-bladder and a biliary fistula was made. No cultures were obtained from the gall-bladder at the operation, but a few hours later plates were inoculated with some of the material discharging through the tube. Several varieties of organisms were found to be present, and B. typhosus and B. coli communis were isolated and identified. The bile discharging through the tube was of a dirty brown color and contained a considerable amount of mucus.

The effect of gradually increasing doses of hexamethylenamin was determined by inoculating plates with the bile discharging through the drainage tube and noting the variation in the actual number of colonies from day to day.

The results of these observations are tabulated in Table V.

The fistula rapidly closed and the patient left the hospital a few days later.

In this case also specimens of the bile were distilled and tested chemically, after each increase in the dose. Rough estimations made by comparing the color given by the distillate on different days seemed to indicate that the quantity of hexamethylenamin excreted in the bile varies directly as the dose.

The relationship between the amount of hexamethylenamin given in 24 hours and the rapidity with which the organisms disappear is quite strikingly shown in Cases I and III. In the first case the organisms very rapidly disappeared after 75 gr., while in Case III there was a less marked effect on the number of organisms present after 35, 45, and 60 gr., the effect increasing with the dose. These findings would seem to indicate that 75 gr. a day must be given in order to obtain quickly the desired effect in the gall-bladder. Smaller doses, however, continued over a longer period of time may prove equally efficient.

CASE IV.—Dr. Halsted's service at the Johns Hopkins Hospital. The patient was 32 years of age, and was admitted with sharp, intermittent, crampy pains throughout the entire abdomen, associated with nausea and vomiting. It was thought to be an attack of acute appendicitis, but on opening the abdomen, the fundus of a much distended gall-bladder presented in the wound. After aspirating several ounces of pus, the gall-bladder was opened and drained.

At the time of operation, a pure culture of B. typhosus was

TABLE V.

Date.	Dose of hexamethylentetramin for 24 hours. Before giving first dose.	Plate.	Amount of bile inoculated with.	Estimated number of colonies present.	Remarks.
December 4.....		I	1 loop.	150,000	Organisms present: B. coli, B. typhosus, and others not determined.
" 5.....	10 gr.	II	1 "	150,000	Discharging bile of dirty brown color. Foul odor.
" 6.....	20 "	III	1 "	100,000	
" 7.....	35 "	IV	1 "	75,000	Bile still of dirty brown color.
" 8.....	45 "	V	1 "	60,000	Color of bile is improved.
" 9.....	60 "	VI	1 "	20,000	
" 10.....	60 "	VII	1 "	12,000	Drain removed. Wound healthy and clean.
" 11.....	75 "	VIII	1 "	300	Bile has become perfectly clear in the past 24 hours.
" 12.....	75 "	IX	1 "	8	B. coli alone present. Wound healing rapidly.
" 13.....	75 "	X	1 cc.	Sterile.	
" 14.....	75 "	XI	1 cc.	"	
" 15.....	75 "	XII	1 cc.	"	Wound practically healed.

obtained from the gall-bladder. The patient is quite sure that she never had typhoid fever.

This case was not brought to my notice until 10 days after the operation, during which time she had been receiving a prophylactic dose of 15 gr. of hexamethylenamin a day, because of the necessity of frequent catheterization. At the end of this time cultures from the sinus proved to be absolutely sterile. The dose was then increased to 30 gr. a day. The material aspirated from the sinus showed the presence of hexamethylenamin and a subsequent culture failed to reveal the typhoid bacillus. The patient was discharged on the 26th day after operation in excellent condition.

Observations have been made on two other cases which are interesting in that they demonstrate the appearance of the drug in the cerebrospinal and synovial fluids.

The first case was that of a boy 13 years of age, who had symptoms suggesting a cerebellar tumor. At the exploratory operation, nothing definite was found. A decompressive operation was done and the wound closed. A plaster dressing was applied and on removing it 12 days later, a cerebrospinal fistula was found in the upper part of the incision. At this time his temperature ranged between 100° and 103°; the discharging fluid contained a few pus cells, bacteria, shreds of necrotic tissue and it was feared he would succumb to meningitis. Acting on Dr. Cushing's suggestion, that hexamethylenamin might possibly be excreted by this route also, the boy was given a 10 gr. dose of the drug and five or six hours later some of the discharging fluid was collected and tested. A distinct test was obtained and the dose was increased to 30 gr. a day. Three weeks later under this treatment the fistula had closed entirely and the temperature was practically normal.

The second case was one of acute gonorrhœal arthritis. The knee-joint was tremendously swollen, very hot, and tender. In order to determine whether the drug appeared in the synovial cavity, the patient was given a 15 gr. dose of hexamethylenamin at 9 a. m. Nine hours later the joint was aspirated and about 100 cc. of pus withdrawn. The chemical test showed the presence of hexamethylenamin in considerable amount. Cultures taken at this time proved the infecting organism to be the gonococcus. The dose was immediately increased to 80 gr. a day and four days later, cultures from the joints showed a marked decrease in the number of organisms present. A third aspiration, ten days after admission, showed that the organism had completely disappeared. During this period, the clinical condition of the joint improved markedly. The effusion into the joint and the acute tenderness rapidly disappeared but there still remained some periarticular infiltration and some limitation of motion. After receiving 80 gr. a day for 24 days the patient developed painful and frequent micturition, which immediately disappeared, however, on withholding the drug. No albumen or red blood corpuscles were found in the urine and only a slight increase in epithelial cells was noted.

Several cases of hematuria following the administration of hexamethylenamin have been reported (13). In this series of cases, however, no such symptom was noted but subsequently several cases have developed painful micturition. This symptom rapidly disappeared on withholding the drug. In no case was a gastro-intestinal disturbance set up, and even after 80 gr. a day for 15 days, the appetite remained good, the bowels regular. In the experimental work on dogs, the kymographic record showed no disturbance of the blood pressure, pulse, or respiration after the intravenous injection of 30 to 45 gr.

There has been much discussion as to whether hexamethylenamin is excreted as such or as its decomposition products, formaldehyde and ammonia. The question is of considerable

importance, because formaldehyde is strongly antiseptic, while hexamethylenamin exercises a much weaker, although distinct antiseptic action.

Hexamethylenamin yields formaldehyde so readily on treating it with various substances that it may be said to respond to all the formaldehyde tests with which we are acquainted. Its solutions, however, give the test distinctly more slowly than formaldehyde itself. Hence it is impossible to apply formaldehyde tests in the presence of hexamethylenamin. On the other hand, hexamethylenamin may be tested for, even in the presence of formaldehyde, by the well-known reaction with bromine water, i. e., tetrabromhexamethylenamin appears as a precipitate, even in a dilution of 1 : 50,000 according to our determination. From this it will be seen that it is easy to demonstrate the presence of hexamethylenamin in a given excretion, but the bromine water test throws no light whatever on the presence of formaldehyde.

Our attempts to take advantage of the great differences in the volatility of these substances has likewise proved futile. Hence we can only state that in case we get the bromine test for hexamethylenamin, a part of the drug appears undecomposed and must leave open the question as to whether a part of it appears as its decomposition product.[2]

We have already indicated that the formation of hexamethylenamin from formaldehyde and ammonia is a reversible process, the equilibrium point of which varies with the temperature and the reaction of the solution. It also seems quite logical to suppose that the equilibrium may vary with the organic constituents of the solution. Until quantitative methods are developed for the determination of formaldehyde and hexamethylenamin in the presence of one another, we cannot hope to obtain any satisfactory solution for this phase of the problem. Our bacteriological results would, however, rather lead us to surmise that at least a small part of the drug appears in the bile as formaldehyde.

In this report we have contented ourselves with the chemical proof of the occurrence of hexamethylenamin or formaldehyde in a given excretion; with the study of the therapeutic effects of the drug on those clinical conditions which the chemical work indicated might be successfully treated; and with the result of the treatment, as shown by bacteriological examination. Before the therapeutic value of hexamethylenamin in infections of the gall-bladder can be definitely established a larger number of cases will have to be observed.

The principal results of the work may be briefly summarized as follows:

1. After its administration by mouth, hexamethylenamin appears in the bile and pancreatic juice of dogs. It finds its way into the bile both through the liver and through the wall of the gall-bladder.

2. It has been demonstrated in the bile, cerebrospinal fluid, synovial fluid, saliva, pleural effusion, and blood of man.

3. When given in sufficiently large doses (75 gr. per diem) it appears in the bile in quantities which suffice to exercise a decided bactericidal action.

I am pleased to acknowledge my indebtedness to Dr. Ford for assistance in the bacteriological part of the work; for the clinical material I am under obligations to Doctors Halsted, Kelly, Finney, Cushing and Miller. To Dr. Loevenhart I am especially indebted, since the work was carried out entirely under his directions, and by his unfailing interest and actual help in carrying out the experiments the work was made possible.

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A SATISFACTORY PRESSURE BANDAGE FOR THE LEG.

By John Staige Davis, M. D.,
Assistant-Surgeon, Out-Patient Department, Johns Hopkins Hospital.

For some time I have been interested in comparing the relative merits of the various bandages used in the dispensary of the Johns Hopkins Hospital in the treatment of those cases requiring even pressure on the leg. Having often observed the creased and uneven condition of the skin of the leg, on the removal of the ordinary, and the modified spiral reversed pressure bandages, it seemed that some other style of bandage might prove more satisfactory. The object aimed at, is a bandage which, with the minimum creasing of the skin, will give any desired amount of even pressure; be comfortable; and stay on snugly until removed.

It has been often demonstrated that in the rapidity of healing, in leg ulcer cases, much depends on the proper support. Many of the ulcers will close over quickly, simply by keeping them clean and bandaging with even pressure from the root of the toes to the knee.

Most of the patients seen in the dispensary are compelled to keep on with their daily work during treatment, therefore it is important to have the bandage stay snug. The patient often returns with the ordinary bandage loose about the ankle. The comfort of the bandaged limb is also very important, as the patient will sometimes loosen a bandage which does not fit evenly, in order to be comfortable, and thus delay the result. After trying several methods of bandaging for pressure, I have adopted the use of the figure-of-eight with long sweeps fitting accurately, and following the contour of the leg, and have found it most satisfactory.

Method of application.—Elevate the leg; sponge the skin with alcohol; dress the ulcer, and sprinkle the skin with dusting powder. Cover the entire area to be bandaged with glazed cotton (Fig. 1). Over this, with either 2-inch or 2½-inch muslin bandage, take a loose turn around the ankle; then, with ordinary snugly-fitting figure-of-eight, bandage the foot and ankle from root of toes (Fig. 2). Follow the contour of the leg, upward to above the calf, making both edges of the bandage fit flat (Fig. 3). Then, after a circular turn, come down the leg with a long sweep (Figs. 4, 5). Repeat the above, but with shorter sweeps always following the contour of the leg, and keeping both edges of bandage flat (Fig. 6). The pattern develops as this procedure is carried on, terminating in one or more circular turns (Figs. 7, 8, 9). Figs. 10 and 11 were taken of this same bandage, it having been on one week, the patient going about his usual active employment in the interval. The following plates point out the effects on the skin of the ordinary spiral reversed bandage (left leg in Figs. 12, 13) and modified spiral reversed (left leg in Fig. 14), in contrast to the bandage described above, as shown in right leg in these plates. Let me add, that the spiral reversed and the modified spiral reversed bandages were put on for me by experienced men. This modified figure-of-eight is equally useful for a gauze bandage retaining a dressing.

In order to have the edges of the pattern show clearly in the plates, I have dipped the ends of a tightly-rolled bandage into a dish of ink, allowing it to stand for several hours.

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FIG. 1.—Leg and foot covered with glazed cotton.

FIG. 2.—Foot bandaged with figure-of-eight.

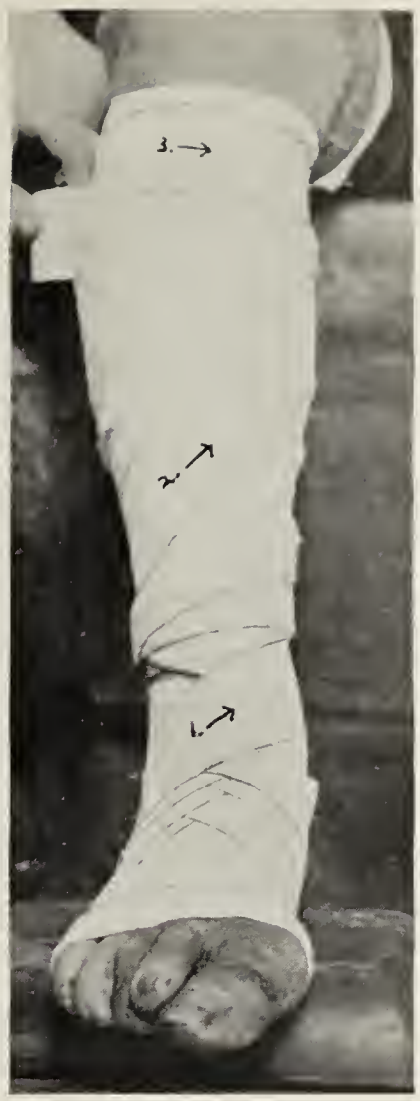

FIG. 3.—Follow contour of leg upward in direction of arrows.

FIG. 4.—Follow contour of leg downward in direction of arrows.

FIG. 5.—Side view of same.

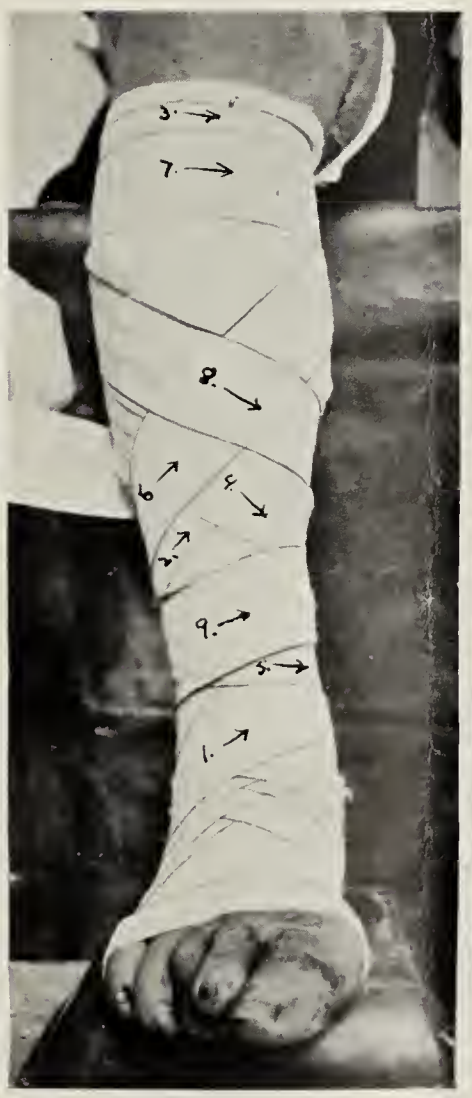

FIG. 6.—Further stage with shorter sweeps.

FIG. 7.—Pattern developing.

FIG. 8.—Completed bandage.

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FIG. 9.—Side view of same.

FIG. 10.—Same bandage after being on one week.

FIG. 11.—Side view of same.

FIG. 12.—Effect of spiral reversed bandage on skin of left leg. Figure-of-eight on right leg.

FIG. 13.—Back view of same.

FIG. 14.—Effect of modified spiral reversed bandage on skin of left leg. Figure-of-eight on right leg.

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THE EFFECT OF INJECTED LEUCOCYTES UPON THE DEVELOPMENT OF A TUBERCULOUS LESION.[1]

By Eugene L. Opie, M. D.,

Assistant-Director of the Rockefeller Institute for Medical Research, New York.

The purpose of the experiments which will be described has been to determine the effect of injected leucocytes upon the development of a tuberculous lesion. For these experiments, the dog, which is somewhat insusceptible to tuberculosis has been seleeted, since preceding studies have demonstrated methods by which it is possible to obtain leucocytes in great quantity in large part free from the inflammatory irritant which had been used to cause this accumulation. Repeated injection of turpentine into the pleural cavity of the dog produces a sero-purulent or purulent exudate; perhaps a fourth of the volume consists of cells which are polynuclear leucocytes and in smaller number small and large mononuclear eells.

Injection of a suspension of tuberele bacilli into the right pleural cavity of the dog produces a tuberculous lesion which is fatal in most instances at the end of five or six weeks. Upon the pleural surfaces and in the adjacent membranes are found flat nodules and masses of newly formed tissue which undergo easeation. The sternal lymphatic glands are of immense size and are caseous; bronchial, retropleural, and retroperitoneal glands exhibit the same lesion and death occurs with generalized miliary tuberculosis.

The experiments which will be deseribed have been possible only because the course of the ehange can be followed during life. Percussion of the animal's ehest shows an increase of dulness well-marked a few days after injection of the microorganism. The relative dulness eaused by projection of the heart to the right of the median line increases and usually after a week or ten days absolute dulness makes its appearance. Autopsies have shown that such dulness is referable in part to the accumulation of fluid within the cavity, in part to the presence of solid tuberculous masses within the mediastinum. Absorption of fluid may in the later stages of the disease be associated with diminution of the area of dulness.

Washed leucocytes obtained by the method which has been described eause a readily recognizable reaction when introdueed into the pleural eavity of a normal animal. Ten ec. injected into the cavity cause an accumulation of fluid indicated by the presence of a wide area of relative and perhaps of absolute dulness in the dependent part of the animal's chest. This abnormal dulness disappears after two or three days and the cavity returns to normal. In an animal which had reeeived four injections at intervals of about a week the pleural surfaces were found to be wholly normal. The quantity of fluid which accumulates and the duration of the reaction increases with the quantity of injected leucocytes.

[1] Summary of a paper read before the Lænnec—a Society for the Study of Tuberculosis, The Johns Hopkins Hospital, January 31, 1908.

Injection of leucocytes into the pleural cavity which is the seat of tuberculous infection alters materially the clinical course of the disease so far as it is indicated by alteration of the relative and absolute dulness over the surface of the diseased cavity. Sueh injection was made only after material increase of dulness indicated that the tuberculous lesion was well established. Injection of approximately 10 cc. of leucocytes into the tuberculous chest was followed in most instances by decrease of dulness appreciable within twenty-four hours after injection. In some instances the dulness at the end of twenty-four hours was increased but subsequently diminished so that at the end of two days the original level was depressed. Injeetion of large quantities of cells, for example 20 cc., was almost constantly followed by a material inerease of dulness with subsequent fall below the original level. By repeating such injections at intervals of about a week, it has been possible to cause complete disappearance of dulness referable to the tuberculous infection.

This disappearance of abnormal dulness may not be permanent and cessation of injection may be followed by its return. The result of a series of experiments, Series A, begun six months ago was as follows:

Two controls died at the end of five weeks. Two animals reeeiving three injections of leucocytes lived two months: a third injected animal (four injections) lived three months and a fourth injected animal is now (after six months) living and well.

In a second series of experiments Series C, the immediate results of injection have been identical with those just described and in four animals increased thoracic dulness has completely or almost completely returned to normal. The animals are well and have increased in weight. Two of three animals infeeted with tuberculosis as controls died at the end of five weeks; the third animal weighing 8 k. is living and apparently in good condition, although there is much increased relative dulness over the dependent part of the chest.

Of two animals (Series B) injected with the same suspension of B. tuberculosis, that which received injeetions of leueocytes died before the untreated animal. Repetition of leucocytie injection after an interval of three days and an unusually large injection (30 ec.) were followed by continued inerease of dulness and death occurred at the end of 56 days. The untreated animal was killed for comparison and exhibited large tuberculous masses in the mediastinum and elsewhere, whereas the animal which received leucocytes contained, in corresponding situations, small scar-like lesions.

In several instances, tuberculous animals which have repeatedly received leucocytes have been killed for comparison

with untreated animals. The pleuræ and mediastinum have become almost entirely normal while in the control there are numerous tuberculous nodules and caseous masses.

Simultaneous injection of tubercle bacilli and leucocytes (10 cc.) retards the development of the tuberculous lesion but does not prevent it.

Certain facts indicate that exudates in which polynuclear leucocytes are numerous and active have greatest influence upon the tuberculous lesion. Preserving leucocytes on ice apparently impairs their efficiency. Exudates in which polynuclear leucocytes are scant appear, so far as can be determined from a few experiments, to have little effect upon the tuberculous process. Since in the early stages of the tuberculous pleurisy, polynuclear leucocytes are very numerous, it is not improbable that injection of these cells aids the animal by reinforcing its usual means of resistance.

PROCEEDINGS OF SOCIETIES.

THE JOHNS HOPKINS MEDICAL SOCIETY.

January 20, 1908.

Meeting of the Johns Hopkins Hospital Medical Society, Dr. Norton presiding in the absence of Dr. Finney, president of the society.

I. Exhibition of Cases. Dr. Miller.

The speaker reported the history and result of a pericardiotomy done on a boy, 7 years old. The patient was admitted to the hospital with a history of having had fever for about two weeks, some pain in the chest, and dyspnœa. Twenty-four hours before admission the patient developed œdema of the face and ascites. At this time the patient's brother had scarlet fever, but he himself had no eruption and seemed to be free from this disease.

On admission the boy's leucocyte count was 17,000, and a diagnosis of right-sided pleurisy and pericarditis with effusion was made. Four days later, 380 cc. of turbid fluid was aspirated from the right chest. Six days after admission, 400 cc. of turbid fluid was withdrawn from the right chest and 28 cc. from the pericardium. After a few subsequent tappings of the chest and pericardium it was resolved to lay open the pericardium. Since the boy had a right-sided empyema it was important to preserve the left pleura. The fifth costal cartilage on the left side was accordingly resected, the triangularis sterni muscle and the internal mammary artery pushed aside, and pericardiotomy performed. The wound was treated by free drainage. On the following day on account of the very marked dyspnœa the sixth rib on the right side was resected and much turbid fluid evacuated.

The boy got along perfectly well for two weeks, when an osteo-myelitis of the sternum developed. This was operated on. There was marked post-operative shock, and the following morning at four o'clock the patient had a severe hæmorrhage from the pericardial sac. The active hæmorrhage was controlled by large injections of morphia and by plugging the wound in the chest and holding the chest wall for forty minutes.

Since then there have been two more hæmorrhages. The pericardium is now full of blood and the clot has plugged up the opening in the anterior wall of the pericardium, reproducing a closed pericardial sac. Exertion, such as coughing, has been followed by a large gush of fresh arterial blood from the wound. The general treatment has been expectant and large doses of morphia have been constantly administered. The child has lived 17 days since operation which in itself is hopeful.

Roberts has reported 35 cases of suppurative pericarditis treated in this way; 15 recovered, 10 died of septicæmia, and 10 died of various post-operative complications. Dr. Miller was able to find only one other case reported which was complicated by hæmorrhages; and here the bleeding came from fresh granulations in the pericardium. This case died five days after operation

II. A Study of the Cases of Pneumonia Empyema Occurring in the Johns Hopkins Hospital. Dr. McCrae.

It is no more clear why empyema appears in connection with lobar pneumonia than why it fails to occur. In view of certain statistics that give the pneumococcus as being found in the pleura in 100 per cent. of pneumonia cases, one would expect to find empyema more frequent. Since patients do not vary so much, while there is a wide range of complications, the more likely explanation of the cause of empyema lies in the particular virulence of the organism concerned. The statistics from all hospitals indicate that empyema is on the increase. At the Johns Hopkins Hospital there have been to date 805 cases of pneumonia, and 29 of empyema—a proportion of 3.6 per cent.

The speaker considered empyema in a vast majority of cases rather a complication than a sequel of pneumonia—a conclusion based on the facts that autopsy revealed empyema in certain cases dying of pneumonia and that in the greater number of cases fever is more or less continuous. Of the 20 cases, 6 occurred in children under 10 years while the largest number were in patients between 20 and 30 years of age. No predisposing factor was evident. Twenty-two of the 29 cases yielded positive bacteriological cultures: of these, 20 were caused by the pneumococcus and 2 by streptococci. Usually the character of the attack of pneumonia was serious. In all but 3 cases, more than one lobe was involved and in every instance there was consolidation of the lower lobe. Empyema did not occur on the side opposite to the pneumonia.

In no case was there any clue to indicate the onset of the empyema. Apart from physical signs the thing that first attracted attention was continuance of the fever: in 20 the temperature was never normal; in only 2 was it normal for 24 hours or more.

So far as general features go, fever was the most constant symptom met with. The fever was irregular in type, usually 102.0° to 103.0°, sometimes remaining high and in other cases tending to drop. In a few cases after crisis there was sudden distress and dyspnœa. The pulse showed much variation and nothing characteristic. The leucocyte count was of no great value in diagnosis; in all cases there was marked leucocytosis. A feeling of resistance to the palpating hand was an important physical sign, and suggested fluid when other signs were all against it. Vocal fremitus was retained to a greater or less degree in 15 cases, and the presence of this sign often led to delay in aspiration. Several cases showed a slight clearing followed by dulness; only one showed movable dulness. In only 5 cases were the breath sounds abolished, in 22 they were diminished. In no instance was there displacement of the heart.

All in all, the problem of concurrent pneumonia and empyema is not a simple one, and is very different from that in ordinary primary empyema. We cannot depend on the ordinary signs of fluid in the thorax and therefore we should resort to the needle for early diagnosis. The needle should be used again and again if necessary. It is very likely that the amount of fluid is comparatively slight and it is not easy to strike a small layer of fluid. Only one case was recognized in the first week, while 7 were diagnosed in the second, and 10 in the third week.

The mortality in these cases was 24.1 per cent. Two died of pneumonia, and one of septicæmia (streptococcus) 13 days after operation. In all the remaining cases that died there was some complication, such as pericarditis, pericarditis and meningitis, endocarditis and meningitis, or myocarditis. With earlier recognition of the empyema, perhaps the complications would not have occurred.

In summarizing, the speaker emphasized the points that empyema in the majority of cases is present at the time of the pneumonia; that early diagnosis is important; that, on account of the anomalous physical signs, needling is an important diagnostic measure; that with early operation patients usually recover quickly and are left with an intact thorax; and that those patients in this series who have been followed since leaving the hospital have done surprisingly well.

Discussion.

Dr. Futcher.—We ought all to have impressed upon us the fact that empyema is a complication, and that we should be on the lookout for the development of an effusion in the course of pneumonia. If an effusion does occur it will very probably be a purulent one. You will remember how Dr. Osler used to impress upon us the causes for the continuance of fever after pneumonia. These were due: first, to empyema; secondly, to delayed resolution; thirdly, to a mistaken diagnosis of what later turned out to be a tuberculous bronchopneumonia or phthisis florida; fourthly, to the possibility of more distant complications like pneumococcus arthritis or meningitis.

III. A Clinical Study of the Alkalinity of the Blood.* Dr. Strouse.

The author discussed briefly the chemical nature of the blood, emphasizing especially the lack of exact knowledge of this subject. The alkaline reaction of the blood is not due to sodium hydrate, but depends probably on the presence of sodium carbonate and sodium phosphate. The clinical methods of measuring the alkalinity in use have been inexact, owing to technical difficulties; and the results published so far have not been of any real value. In this work Dr. Strouse used a modified method of capillary pipette titration as described by Moore and Wilson. In about 75 cases studied his experiments show that changes in the amount of neutralizable alkali occur in various diseases, that these changes are not constant and bear no positive relation to the clinical picture.

In view of these results and the extreme variations found by other men the speaker thought that these variations are not specific to any disease, but that they indicate a disturbance in the individual, probably due to altered oxidation. So far the clinical study of the alkalinity of the blood has not given results of even empirical value. Such studies will not yield conclusions of practical importance until we have a definite knowledge of the causes of the relatively slight changes in the alkalinity seen in disease.

Discussion.

Dr. Boggs.—In this work that Dr. Strouse has reported I was convinced that results of delicacy could be acquired when the experiments were done by one person. I am convinced that Dr. Strouse's investigations have shown that we can expect little or nothing as to diagnosis by these methods.

Dr. Voegtlin.—Dr. Strouse deserves credit for destroying facts that have been regarded as well-establshed. Most textbooks are very positive in their statements about the alkalinity of the blood. Recent work on the problems of immunity has shown that salts, bases, acids, etc., have great influence on the growth of bacteria, and it seems worth while to work out some good method for obtaining accurately the degree of alkalinity of the blood.

* This paper will appear in full in a forthcoming number of The Johns Hopkins Hospital Bulletin.

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NOTES ON NEW BOOKS.

A Very Young Ovum in Situ. By Professor G. Leopold. Translated by W. H. Vogt, M. D. 69 pages with 16 lithographic plates. Price, $3.50. (*St. Louis: C. V. Mosby Company, 1907.*)

The embryologists who are familiar with Prof. Leopold's scientific work may welcome the translation of this monograph, but it appears to the reviewer that the work of the translator and the expense of the American publisher are for naught.

The monograph of Peters, which describes the youngest human ovum, is very recent and is in every respect far superior to Leopold's. Leopold does not contradict, nor add to, any of the statements made by Peters. For this reason it would have been better to translate Peters' monograph, but even that is unnecessary, for within a very short time after its publication, the youngest human ovum (Peters') found its way into the literature, including that of America.

However, Leopold's monograph is of value as a careful description of a pathological ovum. If the reviewer is not mistaken some of his other young ova, which are widely copied (see Williams' Obstetrics, 1903, Figs. 107, 108, and 109), are also pathological and by no means as young as Leopold would have us believe they are. (See His. Archiv for Anatomie, 1897.)

Only a superficial comparison of Leopold's last monograph with that of Peters' shows at once that there are marked differences between the two very small ova described by these authors. In Peters' ovum we have a beautiful and vigorous specimen, with a most active syncytium carefully adjusted to the mucous membrane of the uterus. Its implantation seems to have been perfect, corresponding with that seen in other mammals, and it contains an embryo which fits with the series described by other authors. Leopold insinuates that the ova described by Graf Spee, Heukelom, Mertens, and others "can hardly be pronounced normal specimens free from objections." In reality the criticism applies to his own specimen, for it is encapsulated in an atrophic decidua, is covered with long slender villi tipped with a scanty syncytium and the cœlum is collapsed and filled with mother's blood. No anlage of an embryo was found, but intermingled with the blood in the cœlum there is an extensive hyaline magma (Plate X) which alone indicates that the ovum is pathological.

In the preface (p. 7) Leopold shifts the responsibility for this elaborate publication upon Graf Spee, "who did not question in the least the good histological presentation of this specimen." It is interesting to note that Graf Spee in reviewing this work (Schwalbe's Jahresbericht für Anatomie, 1906) states that the ovum must have been torn, for it is filled with mother's blood and probably for this reason the embryo was not found. He further states that nothing new is given in Leopold's monograph, all of which may be found in Peters'; in fact, he says, for new interpretations the specimen is not of sufficiently good quality.

It is found that the pathological ova from early tubal pregnancies, as well as those from uterine pregnancies, often appear like that described by Leopold. The implantation is imperfect, the syncytium scanty, the villi atrophic or hypertrophic and well imbedded in a great mass of mother's blood. The wall of the chorion collapses, becomes filled with blood, and the anlage of the embryo is often missing. Leopold's monograph describes such an ovum at a very early stage which may be compared with Peters', undoubtedly a normal one, of the same size.

That Leopold's specimen was taken from a woman who committed suicide is no proof that it is normal when we consider that 7 per cent of all pregnancies end in pathological ova. It may be in one of the 7 per cent. Furthermore, over one-third of the abortions of the second month and over three-fourths of those of the first month are pathological specimens, and it is probable that if we obtained all of the specimens of the first two weeks, the per cent would be still higher. The probabiliy of pathological to normal in very young specimens found in the uterus is undoubtedly as high as one in five.

The reviewer is of the opinion that Leopold's specimen will not trouble the literature on normal human embryology, but may for a time find its way into text-books on obstetrics. It is, however, of great value in the study of pathological embryology, but this is not increased by its translation.

The drawings are fairly good, the lithography is excellent, but the typography and paper are of inferior quality. The plates were made in Germany, and the text was printed in America.

Franklin P. Mall.

Surgical Diagnosis. By Daniel N. Eisendrath, A. B., M. D., Adjunct Professor of Surgery in the Medical Department of the University of Illinois (College of Physicians and Surgeons). 776 pages, with 482 original illustrations, 15 of them in colors. (*Philadelphia and London: W. B. Saunders Company, 1907.*)

In the preface the author says the question of diagnosis has been approached chiefly from the clinical standpoint. Also that in some of his apparently arbitrary classifications he has had in mind the clinical picture as one encounters it at the bedside, and that such divisions seem most practical in a book limited to diagnosis and not including pathology and treatment.

In reference to the omission of pathology, it would seem that the value and completeness of the book would be much handicapped, as pathology plays such an important part in surgical diagnosis, and often it is not possible to make a definite diagnosis without a careful pathological examination. This is borne out as we look over the pages.

There are eight chapters, the first six of which take up the various regions of the body in the following order—head, neck, thorax, abdomen, extremities, and spine. The seventh chapter considers almost too briefly the post-operative complications, and in the eighth chapter he outlines the methods of examination of the blood, cytodiagnosis, and the newer methods of diagnosis of renal lesions. The sections upon ureteral catheterization and cystoscopy were written by Dr. Gustav Kolischer, of Chicago.

Some of the descriptions are much too brief to give a clear and accurate idea of the diagnosis; however, in most instances, the differential diagnosis is well considered. There are many excellent tables scattered throughout the text, in which a comparison of surgical conditions giving somewhat similar symptoms, is concisely made.

It is difficult in a volume of this size, not to leave out some of the numerous surgical conditions requiring diagnosis, but on the whole, there are remarkably few omissions.

The illustrations are excellent and aid greatly in interpreting the text. Many of them show the actual method of examination. The general arrangement and classification of the sections are good. The descriptions, in most instances, are clear, and the book is well gotten up.

It is, without doubt, the best work on this subject published so far, and while incomplete and disappointing in some respects, it will be most useful in its field.

The Johns Hopkins Nurses' Alumnæ Magazine. Issued quarterly. One dollar per year. Vol. VI, No. 4, December, 1907. (*Printed by J. H. Furst Company, 23 S. Hanover St., Baltimore.*)

This little journal, now closing its sixth volume, published primarily for the members of the Johns Hopkins Nurses' Alumnæ Association, appeals to all who are interested in nurses and their education and after-training. The number before us contains in

addition to local news, reports of societies, and miscellaneous reading, the following papers: "Emotion: Its Place and Training," by Prof. G. M. Stratton, of the Johns Hopkins University; "Moral Support in the Care of Nervous Diseases," by Drs. Worcester, Coriat, Barker, Thayer, and others; "Social Service at the Johns Hopkins Hospital," by Dr. Charles P. Emerson; "Nursing in Foreign Hospitals," by Dr. H. M. Hurd, and "Paratyphoid fever," by Dr. F. J. Sladen. Such an array of interesting articles shows clearly how much the graduate nurses of this Alumnæ Association are attempting in the line of self-education and knowledge of new methods. The evolution of several local journals with a kindred purpose in connection with some of the larger training schools for nurses speaks well for nurses and indicates a desire to continue a vital connection with the school and tends to develop a gratifying *esprit de corps*.

An Introduction to the Study of the Infant's Stool. Paul Selter, M. D. Translated by Herbert M. Rich, M. D. (*Detroit Medical Journal Company, 1907.*)

In this study the comparison of the feces of normal infants, as well as that of the feces of infants suffering from different types of gastrointestinal disturbances, is considered. The short and concise presentation of the subject will be appreciated by many practitioners. S. A.

Operations of General Practice. By Eldred M. Corner, M. B., F. R. C. S., etc., and H. Irving Pinches, M. B., M. R. C. S., L, R. C. P., etc. 296 pages, with numerous illustrations. Price, $5.50. (*London: Oxford University Press, 1907.*)

The object of this little work, as stated by the authors, is to describe the technique of minor operations in sufficient detail to render the general practitioner capable of performing them.

In Chapter 1, the necessity for surgical cleanliness is not sufficiently emphasized, nor are the methods for obtaining it dealt with fully enough.

The chapter on anæsthetics is fairly full, but certain statements are erroneous. Thus, nitrous oxide gas is said to be suitable only for operations lasting from one to two minutes; whereas, when properly given, it has often been found not only safe, but perfectly satisfactory for relatively long operations. Again, the authors say that ethyl chloride is safer than ether, whereas reliable statistics show a mortality of one in ten thousand for the former against one in fifteen thousand for the latter. Then, again, in speaking of the giving of ether, the closed inhalers are mentioned, but very little is said about the ordinary cone, so often used with satisfactory results in America. Nor can we agree with the authors that the "drop method" is only suitable in the case of children.

The removal of sebaceous cysts from the scalp and other simple operations are fully dealt with and might well be performed by the general practitioner, but we do not hesitate to object that such conditions as rodent ulcer and epulis should be left to a skillful surgeon and one who knows his pathology. Nor can the general practitioner always correct a hair lip without leaving a considerable degree of deformity.

Catheterization of the Eustachian tube is a procedure requiring delicacy and skill, and is generally best left to the aurist; and tuberculous glands may be deep-seated and tax all the skill of an experienced surgeon. Again, it must be emphasized that all tumors of the breast should be left for the experienced surgeon, since every one of us has seen unfortunately more than once the dire consequences resulting from mistakes in diagnosis and insufficient removal.

Suprapubic cystotomy is stated to be a simple operation, but we are not sufficiently warned that in certain cases the peritoneum is bound down in such a way that it is difficult to avoid it and that when this mistake is made and not recognized and rectified, infected urine will pass out into the peritoneum and set up a peritonitis. In one who does not understand how to meet all exigencies, suprapubic puncture is much safer. Before he operates upon hernia or varicocele the general practitioner should have done all in his power to make himself a competent surgeon.

Stricture of the urethra is treated of in a short, but fairly satisfactory manner. The method of removing a pin from the ureter is ingenious.

Carbolic acid or iodine as curative agents for hydrocele are recommended, but they are now condemned by the best authorities.

The directions and illustrations dealing with the treatment of infected fingers and hands are useful.

The authors state that only a few ounces of salt solution can be infused at one time—this statement is certainly contrary to general experience.

To a graduate of the present day, illustrations of hypodermic syringes would seem to be superfluous, except perhaps in a dealer's catalogue.

The chapter dealing with the shoes adapted to various deformities of the foot is well worth reading.

In conclusion we doubt if the present work adds much of any great value to what is obtainable from the already existing surgical text-books. Certainly many operations are described and recommended that in the hands of the general practitioner might be not only harmful, but dangerous.

Surgical Emergencies. By Percy Sargent, M. A., M. B., B. C., F. R. C. S. Price, $1.50. (*London: The Oxford University Press, 1907.*)

In this small book of 256 pages the author proposes to discuss surgical emergencies in such a way as to enable the practitioner to meet them properly. As may be said of the majority of short treatises, the descriptions given will prove of little value to the surgeon and are entirely inadequate in detail to be of benefit to the practitioner who is unfamiliar with the subject.

In the chapter on hemorrhage several important points are omitted. Not enough is said about packing a wound which is bleeding and the after treatment of hemorrhage is not sufficiently discussed.

In giving infusion of salt solution, the author favors the use of an antitoxine syringe and condemns the usual method as tedious, painful and requiring the undivided attention of the nurse.

Burns and scalds in the main are well dealt with, but we must take exception to the summary condemnation of all ointments. The author holds that greasy substances favor suppuration, and that where they have been applied an anæsthetic should be given and the burned surface thoroughly cleaned with soap and water.

Skin grafting would rarely be done as an emergency operation.

The chapter on fractures is very deficient. Wiring of the patella should never be done by any other than experienced hands. The operation in itself is simple enough, but the knee-joint is very easily infected and a faulty operation is not infrequently followed by anchylosis or in some cases by general sepsis. Colles' fracture is dismissed—the one, above all others, that should be thoroughly understood by every practitioner—in a few words.

The advice as to the treatment of abscesses, particularly about the neck, is good. The author's definition of a carbuncle, as "a condition of gangrene affecting the skin and subcutaneous tissues in a situation where the tissue is dense and the blood supply poor" is novel, but somewhat unsatisfactory.

Whitlow is an infection of the soft part which extends to the terminal phalanx and sets up an osteomyelitis. It cannot be "subperiosteal" for the reason that the terminal phalanx is not covered by periosteum.

Tetanus is discussed very briefly, and the author has omitted to state that in all cases in which the foot has been wounded by a nail contaminated with garden soil or stable manure, tetanus antitoxine should be given.

Acute abdominal diseases are not treated fully enough to facilitate the making of a diagnosis and the fragmentary notes on operations in this region are of no value. In all such serious conditions it is better to leave the patient to nature than to kill him by bungling interference. The author's general directions in operating are to make an incision through the rectum and then locate and remove the trouble. But between the incision and the location there may be a vast undiscovered country in which the inexperienced operator too often becomes hopelessly lost.

The author fails to appreciate the fact that no one but a surgeon should attempt to deal with a gangrenous intestine.

The descriptions of intubation and tracheotomy are by no means clear or precise.

Retention of urine is reasonably well discussed, but the operation of renal decapsulation for suppression of urine is not as yet sufficiently well established to be generally recommended.

The notes on injuries to the chest are good, but an inexperienced man should hardly attempt to drain the pericardium.

The method recommended for the routine examination of cases of head injuries is good. The operations described for fractures of the spine and for glaucoma are difficult, and certainly require much skill on the part of the operator.

In short, the book enumerates in an orderly manner the emergencies which are likely to arise in surgical and medical practice, but does not go far towards helping the practitioner to gain the diagnostic skill and to give the surgical treatment demanded by such emergencies.

The Diagnosis and Treatment of Diseases of Women. By HARRY S. CROSSEN, M. D., Clinical Professor of Gynecology, Washington University, St. Louis, Mo., etc. First edition of 799 pages and 700 illustrations. (*St. Louis, Mo.: C. V. Mosby Medical Book and Publishing Company, 1907.*)

The author sets forth the aims of the book in its preface. It "is devoted exclusively to the diagnosis and treatment of diseases of women as those diseases are met with in the office and at the bedside by the general practitioner. No space is given to other considerations (etiology, pathology, major operative technique), except as necessary to bring the work to its highest usefulness as a practical guide in the lines indicated. While no space is taken up with detailed technical descriptions of major operations, much care is taken to set forth clearly the differential diagnosis of the various conditions requiring such operative treatment, the kind of operation called for by the particular conditions present, what the operation is intended to accomplish, the preparation of the patient for operation and the after-care necessary to complete the restoration to health."

Over 220 of the 700 illustrations are original and many of these are reproductions of photographs which represent the various steps in the diagnosis and treatment of pelvic disorders. The remaining illustrations have been chosen from various sources and due knowledge and credit is given these sources, both in the preface and text.

As has been stated, the work is devoted exclusively to the diagnosis and treatment of diseases of women from the standpoint of the general practitioner. The writer has borne this in mind throughout the entire book and has very carefully described and illustrated (especially by photographs) each procedure which he has deemed necessary for the practitioner to understand. The systematic arrangement of the subject matter and the careful attention to detail, even at the expense of overdoing it, both in text and by illustrations should prove of value to the busy practitioner. The index is very meager, and this unfortunately curtails the usefulness of the book. J. A. S.

Confessio Medici. By the author of "The Young People." Price, $1.25. (*New York: The MacMillan Company, 1908.*)

"I only want to confess what I have learned, so far as I have come, from my life, so far as it has gone."

Thus the author closes his preface. The sentence is explanatory of the object of the book, and typical of the author's somewhat labored style. The title at once brings to mind that of the immortal book, "Religio Medici," but the two works are absolutely different, and no further comparison is to be thought of. It seems certain to the reviewer that the author of the "Confessio" must be a London surgeon, who has struggled to make his way. He apparently is not a university graduate, for he maintains that a university education is of little help and that hobbies are not advantageous to the practitioner. His views of general practice are not altogether bright and encouraging, but rather gray. The book, which is a pleasant two hours' reading, was not laid down by the reviewer until he had finished it. Although he did not agree with the author's views on many points, and found the pictures of practice as drawn by the author rather sombre, yet he felt repaid for the time spent in reading this confession, which is evidently sincere. The author believes in character and hard work as being the making of a man, and what better lesson can be inculcated in the student. There is nothing very novel in the views presented, and it is more their manner of presentation which holds the reader's attention to the end and makes him feel he has read a book worth reading as it is. R. N.

Diseases of the Stomach. I. BOAS, M. D. Translated by ALBERT BERNHEIM, M. D. Price, $5.50 net. (*Philadelphia: F. A. Davis & Co.,, 1907.*)

In Germany this text-book is one of the most widely used on this subject, having already reached its fifth edition. Dr. Bernheim is to be congratulated for placing such a valuable book within the reach of English and American physicians. We have read the book with care in this English translation, as we have already earlier German editions, and we feel that it is a peculiarly satisfactory exposition of the subject. Before going into the main body of the work Boas discusses briefly the anatomy of the stomach, both topographical and histological, and in considerably more detail the physiology and chemistry of this organ. In view of the recent work done on these latter lines, this chapter is of peculiar interest, the work of Pawlow and his school being thoroughly considered. The first part of the book proper is devoted to a general discussion of diseases of the stomach. The first subdivision, that given up to methods of general examination, may, we think, be regarded as a classic; the history, the various methods of examination by physical means, the methods of chemical examination, the examination of the gastric contents, and the diagnostic significance of the examination of the urine and of the blood being considered in order. In reading this one cannot fail to realize the enormous wealth of material from which Boas has drawn, and the judicial spirit with which he analyzes this to reach conclusions as to the value of the various methods.

This is followed by a series of chapters on general therapeutics; the diet, the use of mineral waters, physical curative methods, lavage, the employment of acids and alkalies, of artificial ferments, and of bitters and stomachics being considered in order in an equally satisfactory manner.

The second portion of the book is devoted to a consideration of special diagnostics and therapeutics. Acute and chronic gastritis are first considered, then round ulcer, motor insufficiency,

gastroptosis, cancer, syphilis, tuberculosis, and nervous diseases of the stomach.

In this, as in the general half of the volume, one cannot escape the feeling that we are listening to the words of one steeped in wisdom and experience in gastric diagnosis and therapeutics, and not one whose personal knowledge is limited, but whose knowledge of the literature is exhaustive, for while this latter is considered carefully, it is the personal experience of the clinician himself which makes the book so valuable. Certain chapters have been done better, notably that on gastroptosis, which we think has been better handled by both Riegel and Glénard, and that on nervous diseases of the stomach, which is perhaps the least satisfactory chapter in the book.

The translation is in the main excellent, and the press work and the general appearance of the volume extremely good.

Taking it all in all, we regard Boas' Diseases of the Stomach as the most satisfactory book on this subject, and the one that is likely to prove of the greatest value, not only to the specialist in stomach diseases, but to the general practitioner and the medical student as well. T. R. B.

The Bulletin of the Ontario Hospitals for the Insane. A journal devoted to the interests of psychiatry in Ontario. Vol. 1, No. 3, Rockwood Hospital Number. Printed by order of the Legislative Assembly. (*Toronto: Warwick Bros. & Rutter, Limited, 1907.*)

The object of this publication is clearly indicated by its title. The number before us contains many short articles which can but be of decided value to all who have anything to do with the care of the insane at home, as well as in institutions. The paper entitled "Home Treatment" contains useful suggestions to the general practitioner in reference to a variety of procedures of vital importance to the welfare of the insane at home. The methods of forced feeding by means of the nasal tube through the nares or by the stomach tube through the œsophagus, the use of the hot wet-pack with cold applications to the head in cases of excitement, the avoidance of restraint, the importance of rest in bed and the inadvisability of the use of hypnotics except as a last resort are suggestions which are modern and in the line of the best practice. There is also a good account of the use of the continuous bath and an illustration showing its water supply and extra large overflows. A summary of the autopsy findings at Rockwood Hospital is not without interest. Of 417 deaths 118, or 28.3 per cent, were from tuberculosis, or its immediate complications. "Gall-stones were found in 15 cases, either in the gall-bladder, cystic, or common ducts, but in only two (three?) cases had their presence produced serious effects. . . . . No instance of renal or vesical calculus occurred in the series. "Contrary to expectation very few foreign bodies were noted, none at all being found in the stomach. In two cases death followed the lodgment of foreign bodies in the œsophagus opposite the cricoid cartilage (Nos. 15 and 67). In case No. 65 a pin and piece of wooden skewer (2 inches long) were found in the duodenal wall and head of the pancreas and another pin in the peritoneal covering of the anterior wall of the uterus. Case 76 (a tuberculosis subject), however, presented a very curious condition; the appendix was enlarged to one inch in diameter for the last inch-and-a-half, and in its lumen were found 48 common pins, all considerably rusted, and the heads of all pointing towards the tip of the appendix, also three small pebbles and a triangular piece of glass, the whole being set in a mass of mucus impregnated with calcareous salts." In a paper "On Diphtheroid Bacilli," the statement is made that but six cases of general paresis were found among the 600 inmates of Rockwood Hospital, and in these cases diphtheroid bacilli were found in noses and in one case in the tonsil. In other forms of insanity, however, diphtheroid bacilli were found in 18 cases, so that a causative relation to general paresis does not seem to be established. As diphtheroid bacilli were also found in patients in neighboring general hospitals the conviction is forced upon the reader that the bacilli are not uncommon in public institutions. We fully endorse the author's statement that "one hesitates to accept without complete proof the association of diphtheroid bacilli in the causation of general paralysis." The *Bulletin* marks a decided advance in the study of psychiatry in Canadian institutions, and is worthy of praise and the "sincerest of flattery"—imitation.

Immunochemistry; The Application of the Principles of Physical Chemistry to the Study of Biological Antibodies. By Svante Arrhenius. 309 pp. Price, $1.60. (*New York: The Macmillan Company, 1907.*)

The distinguished author of this work here presents to the public a summary of the six lectures on immunity which he delivered at the University of California in 1904. The author together with Madsen and his school have sought to apply the Guldberg-Waage law of mass action to the problems of immunity in the hope of throwing more light on the mechanism of the reaction of antibodies with toxins. Accordingly they assume that the reaction between antibody and toxin does not differ essentially from reactions between crystalloids and try to determine whether or not the reaction is reversible. They study, furthermore, the velocity of the reaction, the equilibrium points, and finally strive to represent the reaction by an equation in which the constant can be realized experimentally. It must be acknowledged that the complexity and instability of these bodies renders such treatment of the reactions extremely difficult and there are probably many who with Ehrlich will question the value of physico-chemical methods until more has been accomplished toward the isolation of these substances and more is known of their chemical character.

The material presented in this work is considered under the following chapters: Reversibility of Reactions between Antibodies, Velocity of Reactions in Homogeneous and Heterogeneous Systems, Equilibrium in Absorption Processes, Neutralization of the Hæmolytic Properties of Bases and of Lysins of Bacterial Origin, Neutralization of Diphtheria-toxin, Ricin, Saponin, and Snake-venoms, the Compound Hæmolysins, the Precipitins and their Antibodies. The author's style is lucid and a mass of most interesting literature is presented in a very readable manner. All who are engaged in research in the field of immunity should have access to the book. A. S. Loevenhart.

Diseases of the Heart. By Prof. Th. von Jurgensen, of Tubingen; Prof. Dr. L. Krehl, of Greifswald; and Prof. Dr. L. von Schrotter, of Vienna. Edited, with additions, by George Dock, M. D., Professor of Medicine, University of Michigan, Ann Arbor. Octavo of 848 pages, illustrated. Cloth, $5.00. (*Philadelphia and London: W. B. Saunders Company, 1908.*)

Nothnagel's Practice is considered to be the best in any language, because it was prepared by authorities in every department which it comprises, and because each author really supplied a complete monograph on the subject which he had to write. The profession will, therefore, be grateful for this translation, all the more so as the volumes can be bought individually, and no one is required to buy the complete series which is expensive. Prof. Dock holds a leading position as a teacher of medicine, and practitioner in this country, and no better editor for this volume could have been chosen. Without a very careful comparison of the original with this translation it would be impossible to state just what additions Prof. Dock has made so as to bring the work up to date, but all purchasers may rest assured that his part has been done conscientiously, and that nothing of importance has been omitted. In translations with additions much of the charac-

ter of the original is apt to be lost, but a skillful editor may improve a book, and to those who cannot read German fluently, this edition will prove invaluable, and they will not miss the interest of the German work, but find other qualities of equal value. R. N.

The British Guiana Medical Annual for 1906. (*Demerara: The Argosy Company, Ltd., 1907.*)

In the history and study of medicine it is important to have reports from all parts of the world, and at this moment when so much attention is given to tropical diseases, about many of which so little is known, every paper by a well trained physician is valuable. The English doctors who have gone out to all parts of the world have won great fame for their scientific work done under all sorts of difficulties, and their study of tropical diseases has been the solid foundation to which others have added their slight contributions. In the report at hand there are brief notes or short papers on ankylostomiasis, anæmia, nervous diseases, yaws, malaria, and other illnesses common to the tropics—papers which add something to our knowledge of these diseases. The report should be in the hands of all doctors who live in the tropics or who teach the medicine peculiar to these countries.

R. N.

Diseases of the Genito-Urinary Organs and the Kidney. By Robert Holmes Greene and Harlow Brooks. (*Philadelphia and London: W. B. Saunders Company, 1907.*)

We took up this recent volume on genito-urinary diseases with a good deal of interest. This particular field of medicine is already very well covered by several excellent text-books. This new one differs from the others in that it "is the conjoint product of a surgeon and a physician," so we are informed in the preface. We have put down the volume with a feeling of keen disappointment. We have rarely had the privilege of reviewing a work which presents so little to commend and so much to condemn.

We learn from the preface that "it has been the purpose of the writers to present in this volume a discussion of the more important disease conditions of the uro-genital tract, taken from the standpoint of the general practitioner and surgeon. In so far as possible they have attempted to incorporate such methods as they personally have found most practical and useful, all of which they believe may be successfully employed in the hands of any well-equipped practitioner, familiar with modern medical and surgical technic." Writing for the general practitioner and giving the results of their own personal experience with the various methods of diagnosis and treatment we expect the authors in their discussion to be definite, direct, explicit, and more or less dogmatic, and especially in the descriptions of methods of treatment which they have "successfully employed" do we expect them to be precise and detailed. One finds, on the contrary, that they are more often vague, diffuse, indefinite, and inadequate. Too often they are satisfied to suggest what may be done *if it seems advisable*, instead of outlining a clear, clean-cut, definite method which they have used and found useful. This tendency to vagueness and indefiniteness pervades the whole book to such an extent that one wonders whether or not the authors have any decided convictions about any one subject or any one method. They make the common and fatal mistake of taking too much for granted on the part of the reader with the inevitable result that their descriptions are lacking in directness and in the essential details so important in a work of this kind.

The arrangement of the subject-matter seems to us most unfortunate. In the opening chapter the general examination of patients is very properly considered. Without further preparation, without warning we find ourselves in Chapter II plunged directly into a consideration of endoscopy, cystoscopy, and catheterization of the ureters, and are told how to determine the permeability of the kidneys. It seems to us that the consideration of these finer methods of diagnosis are out of place here and would be more properly considered after the simpler methods of examination had been described.

In Chapter III the care of urethral instruments and the preparation of the patient and surgeon for operation are considered, while in the following chapter we go on from where we left off in Chapter I with the examination of the urine and urethral exudate. The following twelve chapters are devoted to the kidneys as follows: Chap. V, Embryology, Anatomy, Physiology, Compensation in Renal Disease; Chap. VI, The Blood in Renal Disease; Chap. VII, The Ocular Manifestations of Renal Disease; Chap. VIII, The Kidney in Acute Infectious Diseases; Chap. IX, Bright's Disease; Chap. X, Uremia; Chap. XI, Tuberculosis of the Kidney, The Kidney in Syphilis; Chap. XII, Malformations and Displacements of the Kidney; Chap. XIII, Wounds and Injuries of the Kidney; Chap. XIV, Renal Calculus; Chap. XV, Tumors of the Kidney; Chap. XVI, The Surgery of the Kidney. Two chapters each are devoted to the ureters, bladder, and urethra. These are followed by a short chapter on the Female Urethra. This last seems to us to be out of place, and too brief and superficial to be of any value. It gives one the impression of having been thrown in for good measure. Chap. XXIV considers the Penis; XXV, the Seminal Vesicals and Incontinence of Urine in Children—a rather peculiar combination of subjects; XXVI and XXVII, the Anatomy, Physiology, Pathology, and Diseases of the Prostate Gland; XXVIII and XXIX, the Anatomy, Pathology, and Treatment of Diseases of the Testicle and Epididymis. The last chapter is on Neuroses of the Sexual Organs.

A careful reading of the first chapter on the general examination of patients gives us the impression that the authors have missed a rare opportunity of saying something really valuable. Instead of giving us a definite, concise, practical method of procedure in the routine examination of cases in genito-urinary practice they devote 49 pages to a rather diffuse, incoherent discussion of the possible significance of certain symptoms, the effect of which is to confuse rather than to clarify, and which can be of no practical value in aiding one to make a systematic and careful examination of such cases. We are told (p. 18) that "questions concerning the condition of the stomach and the digestion in general may elicit valuable information," and (p. 24) "information can also be obtained by inquiring into the sexual life of the patient." Undoubtedly, but we are not informed what bearing such information, whatever it may be, may have upon the question of diagnosis. The discussion of urinary fever and its treatment in this chapter seems to us out of place and would be more properly considered separately or in connection with the instrumental examination of the urethra.

We are greatly surprised to learn that the authors "have found the various glass tests advocated for the purpose of locating the seat of urethritis to be misleading." We believe this is one of the most valuable and generally used simple means of locating such lesions. It is little wonder, however, that the tests have proved misleading if made after the manner described by the authors.

Inaccuracy and carelessness of expression are common throughout the book. For example, on page 66, on How to Catheterize the Ureters with the Reverse Cystoscope, we read, "The cystoscope having been introduced with its beak pointing upward, the roof of the bladder will naturally first be seen. The instrument should now be rotated at an angle of 45 degrees and pushed slightly to one side. The field of vision now includes the point at which the ureters should be found." Such carelessness makes the description utterly meaningless and unintelligible.

The discussion of the tests for determining the permeability of the kidneys is too brief, superficial, misleading, and inaccurate to be of any value even in a work of this kind. Only two tests

are mentioned, the phloridzin and the methylene blue tests. We supposed the latter had lost much of the popularity which it enjoyed a few years ago, and to some extent at least has been supplanted by the indigo-carmine test. But we are assured by the authors (p. 70) that they have ascertained the value of these two tests by a series of experiments on eleven patients, seven with healthy kidneys, and four with lesions of the kidneys! This very brief series of cases may appear to the authors sufficiently extensive to justify them in drawing conclusions as to the value of these tests in determining the permeability of the kidney, but we fear it will scarcely prove convincing to those familiar with the subject. It seems to us that such superficial teaching is not only unreliable, but positively pernicious, as it gives the casual reader, unfamiliar with the subject, an erroneous idea of the careful and scientific methods of determining renal function.

The advice given with regard to asepsis in such operations as the instrumental examination of the urethra and bladder seems to us most remarkable. While we are told that the urethra is the natural habitat of organisms capable of setting up inflammation and are warned of the necessity of observing all possible precaution to render the field and instruments sterile, we find no mention of irrigating the urethra previous to the introduction of a catheter in the preparation for a cystoscopic examination. We thought at first this was merely a careless oversight in the description of the technic, but later we read (p. 79) "neither in hospital work nor in private practice is it necessary or advisable previous to the introduction of an instrument to attempt disinfection of the urethra by means of irrigations or disinfecting fluids." Furthermore, we learn (p. 83) "In private practice, if the work to be done is at all extensive, the precautions as regards asepsis are carried out with some difficulty. The frequent changing of sterile clothing during consultation hours is not a very practicable method. It is well, however, for the surgeon to wear a sterile gown; this need not, however, be changed for every individual patient. It is a good plan to use rubber gloves in all cases, even for so simple an operation as the instrumental examination of the urethra or bladder." We presume sterile rubber gloves are meant, but we are not informed whether "it is a good plan" to change them "for every individual patient." We agree with the authors "that the general practitioner will find these suggestions somewhat impracticable—and, we may add, unnecessary and dangerous—and we accept their suggestion to "adopt such modifications as may seem most (more) sensible."

One of the most frequent operations in genito-urinary work that a general practitioner is called upon to perform is to catheterize a patient in his home. We wonder why some of the writers of text-books do not give a method of performing this simple and common operation whereby the most rigid technic as regards asepsis can be carried out very simply and without upsetting the patient and the whole household. In our judgment this is a very important but much neglected matter.

The author's method of treatment of acute urethritis differs very materially from that advocated by the majority of writers on this subject. They rely completely on general internal medication. As regards local treatment they advise a course which may be characterized as one of masterly inactivity.

In speaking of the sterilization of instruments we are told (p. 74) "not only soft rubber instruments, but also silk catheters and bougies may be boiled, provided that the fingers and not other instruments are used in removing them from the boiling water." We have not tried this, but we imagine it would be rather uncomfortable for one's fingers. We are informed further that to remove a silk catheter from boiling water with another instrument would spoil it as the lacquer would be destroyed. "We are indebted for this information to Mr. Wylie, supervising nurse in the male wards of the City Hospital," so the writers tell us. We wonder they had to appeal to outside help for information on this point. We would earnestly suggest that they try the experiment themselves. If they will grasp the catheter lightly with a pair of forceps at the outer (urethral) end, we feel certain they will succeed the first time in removing the catheter without rendering it useless.

We cannot consider the contents of the various chapters in detail, as too much space would be required. In general, the descriptions of the symptomatology and diagnosis of the various diseases considered is too sketchy, brief, inadequate, and gives no clearly defined picture. Certain subjects are treated with great brevity, while others of lesser importance, so far as their frequency is concerned, are treated at relatively great length. For example: Bladder tumors are disposed of in two paragraphs, one of which is largely taken up with remarks on the Nitze operating cystoscope, while the consideration of exstrophy of the bladder occupies seven pages. From the standpoint of the general practitioner this does not appear evenly balanced.

We cannot agree with the authors in the following:

"Not rarely the calculus, in its passage through the ureter, may become lodged there, causing obstruction of that canal. If this takes place the diagnosis can readily be made by the use of the cystoscope" (p. 220). In our experience the diagnosis of this condition has not been so simple.

"The practice of removing portions of the kidney the seat of renal tuberculosis, hydatid or other cysts is increasing" (p. 248). So far as we know, the operation of partial nephrectomy for renal tuberculosis is not increasing, but, on the contrary, just the opposite is true.

"The external sphincter of the bladder seems also to be at least to a considerable degree under the control of the voluntary nervous system" (p. 270). Now what, pray, is the "voluntary nervous system"?

"Even in cases of contracted bladder, if the bladder will hold 150 cc., which is not enough, ordinarily, to permit ureter catheterization, cystoscopy may still be employed." From which we infer that cystoscopy, and especially catheterization, of the ureters cannot be performed when the bladder capacity is much less than 150 cc. Kapsammer says, however, that in such cases a bladder capacity of 40 cc. is sufficient for catheterization of the ureters. Certainly that amount is sufficient for a simple cystoscopy in such cases.

Numerous typographical errors occur throughout the volume. One such is found on page 86, and might be misleading, where one finds "keratin" mentioned when it is evident that "kreatinin" is meant.

We cannot recommend this work to students or general practitioners.

La Pratique de la Médecine. Par William Osler, Professor Royal à l'Université d'Oxford. Traduction française sur la 6e Edition par les docteurs M. Salomon, Chef de clinique à la Faculté, et Louis Lazard, Ancien interne de l'Hôpital de Rothschild. Préface du Dr. Pierre Marie. (*Paris: G. Steinheil, Editeur, 1908.*)

What more royal tribute could be paid to the Regius Professor than to have his work translated into a foreign tongue! All admirers of Osler will be pleased to learn that his "Practice of Medicine" has been translated into French, and to know the high estimate held of it by Dr. Marie who writes a brief introduction, in which he says: "It is not only that Mr. W. Osler is animated by the desire of setting forth in an impeccable manner his medical views, but he desires something more, he wants to be the master who *teaches*. For this task, the noblest which those who are professors or aim to be, can set before themselves the essential qualities are: order, a perfect clearness, a sharp critical

sense, the most profound erudition. All these qualities are to be found in a high degree in the work of Mr. W. Osler; so that since its first appearance this book has met with the most flattering success in all the countries where English is spoken and read." Unhappily the delicacy of Marie's introduction is lost in the translation, but it will be readily seen that he has paid Dr. Osler the highest compliment, and the one which has not been given him in other notices of his book, so far as the reviewer knows. Osler's mastery does lie in exactly the qualities noted by Marie, and his fame will rest very largely on his wonderful ability as a teacher. Another sentence in the introduction to which attention should be drawn is the following: "The chapter on treatment is always written with the greatest care in Mr. W. Osler's work. This is an additional reason why this book merits a warm reception in France and other countries where French is spoken." If foreigners consider that the question of "treatment" has been carefully handled by Dr. Osler, should not this put a stop to all the carping criticism of him and his school that they neglected treatment.

Attention may be called to the fact that Marie speaks of this practice as belonging to the manuals of "Internal Pathology," it is an interesting point of view, which perhaps does not often strike the student, but it is none the less a true one.

Messrs. Salomon and Lazard are to be complimented on a very successful translation, and it will be due largely to their efforts if the work meets the reception in France which is its due.

R. N.

A Text-book of Practical Gynecology. By D. Tod Gilliam, M. D., Emeritus Professor of Gynecology in Sterling-Ohio Medical College, etc. Second Revised Edition. (*Philadelphia: F. A. Davis Company, 1907.*)

It is difficult to see the need for such a work as this. The volume is intended for the use of "Practitioners and Students," but a superficial examination suffices to show that it is an inadequate and unsafe guide for either. The work has its merits, to be sure; the binding and paper are substantial and the type is clear. The author is to be congratulated, too, on the arrangement of his subject-matter and the clearness and forcible presentation of his ideas. It is very evident that he has had a large practical experience, upon which the work is chiefly based. Many of the chapters are satisfactory, when it is remembered that they are intended to set forth merely essential facts, notably Chapter XXIX, which treats of Salpingitis in a clear, terse and conservative manner. Numerous other chapters, too, have many points of merit. The author's method of suspending the uterus, which, with various modifications, is now widely employed, is briefly, but clearly described. No mention is made, however, of the modifications in use, nor of the disadvantages of the operation.

The illustrations are generally poor. Many of them are hazy and indistinct. Full-page pictures of nude women are hardly necessary to represent the various postures, although the importance of correct posture should be emphasized. The photomicrographs are practically meaningless; and the reproductions of gross pathological specimens are of little value. On page 144 the reader finds it more convenient to reverse the volume in order to interpret the picture.

The conspicuous absence of pathology, both gross and microscopic, and the entire lack of references and bibliography, so helpful to the intelligent student, materially lessen the value of the book.

A careful reading of the entire volume reveals many and serious imperfections. Only a few, however, will be alluded to.

No mention whatever is made of the importance of a careful history and general physical examination in dealing with gynecological affections. No instruction is given the student as to history-taking.

The advice given on pages 30-32 with regard to examinations in virgins without anesthesia cannot be too strongly condemned. Such practice is pernicious, to say the least, and serves only to bring the medical profession into disrepute.

Bacteriology is disposed of in one page (!) and part of this space is occupied by the startling statement that "most of these viz., Staphyl. pyogenes albus and aureus, S. pyogenes, B. coli communis, and Gonococcus Neisseri find their natural habitat in the vagina and cervical canal" (!).

Under Technique the author advocates thorough cleansing of the hands with green-soap and scrubbing, and then adds, "To make assurance doubly sure some operators supplement the scrubbing by the use of germicidal chemicals."

The chapters dealing with cancer are far too brief, and some statements made are open to criticism. The importance of careful examination in all cases of unusual discharges in women past middle life is not sufficiently emphasized; nor is the aid of the microscope in making an early diagnosis made clear. Considerable space is taken up describing various vaginal operations for cervical cancer, whereas no mention is made of Wertheim's operation, nor any of its modifications.

The chapters on Fibroid Tumors of the Uterus contain no pathology. Ascites occurring with fibroids is wrongly interpreted. Degenerations are pronounced rare. The occurrence of sarcomatous transformations in fibroids is not emphasized enough; and the electrical treatment suggested deserves only to be condemned.

In the chapters dealing with the urinary system the value of th cystoscope is not appreciated. Vesical tuberculosis is pronounced rare. Important details are omitted in describing the technique of catheterizing the ureters, and the difficulties in using the Kelly cystoscope are exaggerated.

The chapters on Diseases of the Rectum are brief, but clear, and on the whole, good.

The index is full and very good. In many ways the book shows painstaking labor on the part of the author, and in so far reflects credit upon him, but many additions and corrections need to be made before it could be recommended for general use among either students or practitioners.

Surgery: Its Principles and Practice. In five volumes. By 66 eminent surgeons. Edited by W. W. Keen, M. D., LL. D., Hon. F. R. C. S., Eng. and Edin., Emeritus Professor of the Principles of Surgery and of Clinical Surgery, Jefferson Medical College, Phila. Volume III. Per volume: Cloth, $7.00. (*Philadelphia and London: W. B. Saunders Company, 1908.*)

This volume deals with the surgery of the head, neck, thorax, œsophagus, abdominal wall, peritoneum, stomach, liver, spleen, and pancreas. Nearly a fourth of it is devoted to Cushing's article on the surgery of the head. It is undoubtedly one of the best papers in the English language on this subject. Its illustrations are abundant and admirably chosen. Cushing's technical operative skill is well known, and his special method of removing the Gasserian ganglion is now generally admitted to be the most satisfactory. Every surgeon in active practice should read and study this paper, for the author's mastery of his subject is admitted by all who know his work. Other papers written also by leaders are those of Finney, on the surgery of the breast; Mayo Robson's, on the stomach, and the brothers Mayo, on the liver, gall-bladder, and biliary ducts. The other contributors, men of marked ability, are Andrews, Albert Kocher of Bern, who has written on diseases of the thyroid gland; Smith, Brewer, Owen, DaCosta, Munro, Gottstein, and Moynihan. The value of this surgery is enhanced by its foreign associates, and no one except the elder Kocher could probably have written an article on the thyroid gland, based on wider experience, for Albert

Kocher worked with and studied under his father. As a whole, the volume is one of great interest, and adds much to the value of this new system. R. N.

Human Anatomy. Including Structure and Development and Practical Considerations. By Thomas Dwight, M. D., LL. D., Parkman Professor of Anatomy in Harvard; Carl A. Hamann, M. D., Professor of Anatomy in Western Reserve University; J. Playfair McMurrich, Ph. D., Professor of Anatomy in the University of Michigan; George A. Piersol, M. D., Sc. D., Professor of Anatomy in the University of Pennsylvania, and J. Wm. White, M. D., Ph. D., LL. D., John Rhea Barton, Professor of Surgery in the University of Pennsylvania. Edited by George A. Piersol. (*Philadelphia: J. B. Lippincott & Co., 1907.*)

That the study of human anatomy by the judicious blending of structure and development and these with the physics as well as practical considerations can be successfully transformed from a difficult subject into an enticing study is happily proven by this stupendous undertaking.

It is impossible in this review to go into the details of any one or all of the subjects contained therein, nor is it intended by citing special instances to call attention to these to the disadvantage of others, but merely as examples of the various phases treated in the work and which contribute so much to the success of the book.

The aid embryology may be to the study of anatomy finds no better illustration than in the section devoted to the General Consideration of the "Voluntary Muscles," with special reference to those of the neck; here, too, the physics of the subject is well shown. What student will forget the anatomy of the neck when he recalls the action of the muscles upon the walls of the blood vessels, and the effect this has upon both circulation and respiration?

In the Practical Considerations many apparently inconsistent phenomena receive a scientific explanation which will add materially to the student's faith in the patient's complaints; a fact too often ignored by the young practitioner. If we have an anatomical basis for the reflected pain in hepatic, hip, or renal disease, the cause of shock in operations upon the nasal bones or mucous membranes, or the relation of the pain in the arm in agina pectoris, the possibility of a stomach cough, etc., etc., these facts will impress upon the memory the paths for the same. When embryology is called upon to explain anatomical defects we may hope to see the time when the cruel superstition of the effect of maternal impressions will be a matter of ancient history. The arrangement of the subjects and the scheme followed in carrying them to a final conclusion is very helpful. The practical bearing anatomy has to the needs of the student is never lost sight of, so that "Practical Considerations" close every subject treated, and the number and characters of these considerations is so manifold that they alone compensate one for the study of the volume.

The style is concise, yet lucid, and the diction of that genial type which makes the reading a pleasure rather than a task. The mechanics of the book are good, but the amount of information, condensed as it is, makes a volume of rather unwieldy bulk, yet personally I could not say with which part I would be willing to dispense.

A few misprints have been noted; ex: Page 817: Read "thickening" instead of "thicking" (next to the last paragraph on the page). Page 853: Under relations, in second line read "extra-pericardial" instead of "extra-peritoneal." Page 1799: Fifth line from the top read "branching" instead of "brancing." Page 1904: In the illustration of the bladder "internal ureteral" should be "urethral orifice."

Oxford Medical Publications.

Prostatic Enlargement. By C. S. Wallace, M. B., F. R. C. S., etc. *Bacteriology.* By Leonard S. Dudgeon, M. R. C. P., etc. $4.50. (*London: Henry Froude, Oxford University Press,* and *Hodder & Stoughton, 1907.*)

The first portion of the work is devoted to the surgical anatomy and physiology of the prostate and its neighboring structures and the matter is handled in a very thorough and complete manner. The morbid anatomy of the enlarged prostate is then considered in some detail. Much attention is devoted to the gross changes both early and late which occur in the hypertrophied gland, together with the resultant effect upon the urethra and bladder. In his presentation of the morbid histology the author displays an unusually accurate and complete knowledge of the tissues which he is describing. As regards the treatment to be employed he clearly and rightly favors early operative interference before marked renal and vesical changes have occurred. Both the suprapubic and the various perineal methods of prostatectomy are reviewed. As suprapubic prostatectomy is the method most popular in England at present, rendered so by the work of Freyer, it is probably but natural that the author should rather favor this form of prostatectomy. He frankly admits, however, that the small fibrous prostates are much more readily removed by the perineal route.

A short chapter at the end of the volume is allotted to a consideration of carcinoma of the prostate. The subject is rather too briefly handled, considering the frequency of carcinoma of the prostate and the importance of the subject. As a whole, the volume is worthy of much praise.

SMITHSONIAN INSTITUTION.

HODGKINS FUND PRIZE.

In October, 1891, Thomas George Hodgkins, Esquire, of Setauket, New York, made a donation to the Smithsonian Institution, the income from a part of which was to be devoted to "the increase and diffusion of more exact knowledge in regard to the nature and properties of atmospheric air in connection with the welfare of man."

In the furtherance of the donor's wishes, the Smithsonian Institution has from time to time offered prizes, awarded medals, made grants for investigations, and issued publications.

In connection with the approaching International Congress on Tuberculosis, which will be held in Washington, September 21, to October 12, 1908, a prize of $1500.00 is offered for the best treatise that may be submitted to that Congress "On the Relation of Atmospheric Air to Tuberculosis."

The treatise may be written in English, French, German, Spanish or Italian. They will be examined and the prize awarded by a Committee appointed by the Secretary of the Smithsonian Institution in conjunction with the officers of the International Congress on Tuberculosis.

The right is reserved to award no prize if in the judgment of the Committee no contribution is offered of sufficient merit to warrant such action.

The Smithsonian Institution reserves the right to publish the treatise to which the prize is awarded.

Further information, if desired by persons intending to becoming competitors, will be furnished on application.

CHARLES D. WALCOTT,
Secretary Smithsonian Institution.

Washington, February 3, 1908.

BOOKS RECEIVED.

Guy's Hospital Reports. Edited by F. J. Steward, M. S., and Herbert French, M. D. Vol. LXI, being Vol. XLVI of the Third Series. 1907. 8vo. XXXIX + 475 pages. J. and A. Churchill, London.

Queensland Department of Public Health. Report on Plague in Queensland, 1900-1907. (26th February, 1900 to 30th June, 1907.) By B. Burnett Ham, M. D., M. R. C. S., D. P. H. (Camb.) 1907. 166 pages. Fol. Brisbane.

The British Guiana Medical Annual for 1906. Edited by C. P. Kennard, M. D. (Edin.) M. R. C. S. (Eng.) 1907. 8vo. XLV + 171 pages. Demerara.

State Board of Health of the State of Ohio. Twenty-first annual report for the year ending December 31, 1906. 8vo. 551 pages. 1907. Columbus, Ohio.

Confessio Medici. By the writer of "The Young People." 1908. 12mo. 158 pages. The MacMillan Company, New York.

La Pratique de la Médecine. Par William Osler. Traduction française sur la 6e édition par les Docteurs M. Salomon et Louis Lazard. Préface, du Dr. Pierre Marie. 1908. 8vo. 1224 pages. G. Steinheil, Paris.

Surgery. Its Principles and Practice. By various authors. Edited by William Williams Keen, M. D., LL. D. Volume III. With 562 text-illustrations and 10 colored plates. 1908. 8vo. W. B. Saunders Company, Philadelphia and London.

Syphilis. A Treatise for Practitioners. By Edward L. Keyes, Jr., A. B., M. D., Ph. D. With sixty-nine illustrations in the text and nine plates, seven of which are colored. 1908. 8vo. 577 pages. D. Appleton & Co., New York and London.

Diseases of the Breast. With Special Reference to Cancer. By William L. Rodman, M. D., LL. D. With 69 plates of which 12 are printed in colors and 42 other illustrations. 1908. 8vo. 385 pages. P. Blakiston's Son & Co., Philadelphia.

Nothnagel's Practice. Diseases of the Heart. By Prof. Th. von Jürgensen, Prof. L. von Schrötter, Prof. L. Krehl. Edited with additions by George Dock, M. D. Authorized translation from the German, under the editorial supervision of Alfred Stengel, M. D. 1908. 8vo. 848 pages. W. B. Saunders Company, Philadelphia and London.

Text-book of Ophthalmology. By Ernst Fuchs. Authorized translation from the eleventh revised and greatly enlarged German edition, with numerous additions. By Alexander Duane, M. D. With four hundred and forty-one illustrations. Third edition. 1908. 8vo. 908 pages. J. B. Lippincott Company, Philadelphia and London.

Traité Pratique de Thérapeutique Infantile Medico-Chirurgicale. Par les Docteurs, Paul Le Gendre et Aug. Broca. Deuxième édition complètemeut refondue. Avec un formulaire, un tableau posologique et 170 figures dans le texte. 1908. 8vo. 759 pages. G. Steinheil, Paris.

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CONTENTS.

PAGE

John Syng Dorsey: The Secret of His Success. (Illustrated.)
By A. Robin, M. D. 127

Intestinal Anastomosis without Open Incisions by Means of Basting Stitches. (Illustrated.)
By Edward Mason Parker, M. D., and Harry Hyland Kerr, M. D., C. M. 132

A Clinical Study of the Alkalinity of the Blood. (Illustrated.)
By Solomon Strouse, M. D. 137

Cardiohepatic Angle. (Illustrated.)
By W. J. Calvert, M. D. 143

PAGE

Proceedings of Societies.
The Johns Hopkins Medical Society. 145
Exhibition of a Case of Combined Organic and Hysterical Paralysis [Dr. Thomas];—Exhibition of Pathological-Surgical Specimens [Dr. Bloodgood];—Enteritis with Meningeal Symptoms Followed by Multiple Neuritis [Dr. McCarty];—Report of Gynæcological Cases [Dr. Cullen];—A Case of Influenzal Meningitis [Dr. Cohoe];—Exhibition of Cases. Facial Paralysis Following Otitis Media [Dr. Reik];—Standards of Medical Education in this Country [Dr. Bevan].

Notes and News. 148
Notes on New Books. 149
Books Received. 155

JOHN SYNG DORSEY: THE SECRET OF HIS SUCCESS.

By A. Robin, M. D., Wilmington, Del.

In attempting to write a biography, especially that of a man of eminence, one must first determine its object; is it to record dates of birth, death and similar events of life; is it to draw a pen-portrait of a man that will refresh faded images of one since dead; is it to determine his place in history; or to draw from his life an object lesson for those who survive?

I want to give you a pen-picture of John Syng Dorsey; and wish I had power to restore to its original freshness the faded and almost effaced image of the man who, had he been permitted to live longer, would no doubt have become one of the greatest surgeons of America. Samuel D. Gross has done this and I follow him only because I have recently come into possession of some very interesting papers and other documents kindly turned over to me by his descendant, Mrs. Alfred J. DuPont, née Gardner, and with these before me I want to study his life anew and discover the elements in his life which made for success.

John Syng Dorsey came into the world on December 23, 1783, endowed with the potential faculties which a long line of Quaker ancestry had transmitted. His earliest progenitors, D'Orseys, came from England and settled in Maryland. His father, Leonard Dorsey, was a successful merchant in Philadelphia and a brother-in-law of the famous Dr. Physick.

While in school he distinguished himself by displaying the precocity of genius. His classical education was gained at a Friends' Academy on South Fourth Street. There he displayed unusual abilities, especially in acquiring a knowledge of Latin, English and mathematics and graduated at the age of 15 to begin at once the study of medicine under his illustrious uncle Dr. Philip Syng Physick. The entrance of young Dorsey upon the study of medicine was coincident with the end of the most terrible epidemic of yellow fever which had stricken Philadelphia.

Dr. Physick was just relieved of his arduous duties as voluntary resident at the Bush Hill or City Hospital. He was only 32, and recently married to the highly gifted daughter of a distinguished minister of the Society of Friends, and had just commenced his brilliant course of lectures on surgery at the medical department of the University of Pennsylvania, having thus become the colleague of Rush, Shippen and Wistar. D'Orsey, surrounded by such distinguished men, in daily contact with his brilliant uncle, drinking as it were at the very fountain of medical knowledge, how could he do otherwise than apply himself diligently to the study of medicine! This he did with such industry and proficiency that at the age of 19, two years before the requisite age for graduation, he was given his M. D.

His thesis was upon "The Powers of the Gastric Juice as a Solvent of Urinary Calculi." "His dissertation," says Dr. Chapman, his contemporary and fellow-student, "exhibits some original views, illustrated and maintained by a set of pertinent and well-conducted experiments." Another outbreak of yellow fever occurred in Philadelphia at this time, and young Dr. Dorsey, inspired no doubt by the example of his uncle a few years back, entered the City Hospital as resident physician to take up the fight against this scourge, the danger incurred by thus coming in intimate contact with this dread disease not troubling him. In 1794 Dr. Devcze, who had taken a very prominent part in coping with yellow fever and was regarded as an authority on the subject, advanced the opinion that it was not contagious, a view endorsed by the Academy of Medicine, of which Dr. Physick was then president.

In a communication addressed by that body to the Board of Health the following declaration is made:

Many respectable modern authorities assert that yellow fever is not contagious in the West Indies and repeated observations satisfy us that it is rarely so during the warm weather in the United States. None of the cases we have yet seen have propagated it and we conceive it to be an error as absurd in its nature as it has been fatal in its operation upon the city of Philadelphia that the contagion of a disease should adhere to the timber of a ship during a sea-voyage, and should spread from the timber of the ship without contact through an extensive neighborhood, and cease to communicate itself afterwards by long and close connection of the sick with their families and attendants.

How singular that a hundred years later, after the supposed danger from fomites was accepted as an established fact, the same view should be reaffirmed and the non-contagious nature of yellow fever established on solid experimental ground by our Yellow Fever Commission.

No wonder then that young Dorsey, in the words of his biographer, "showed by his fearless conduct that he was no believer in the contagiousness of that singular, and hitherto unexplained disease. So firm, indeed, was his conviction upon this subject that he frequently exposed himself in the most reckless manner, with a view of courting infection."

While thus in the very midst of the battle he improved every opportunity of studying the disease, and performed numerous autopsies while making careful bedside observations.

It may, indeed, appear extraordinary that a youth not quite 20 should display such independent thought and action in so intricate a field as medicine. This precocity may be explained not alone by his inherent ability, but more especially by the medical training which he had received. His was not a well-planned curriculum with a great deal of theory, polyspecialism and hair-splitting refinement of medical teaching. He began to study and practice the science and art of medicine on entering his uncle's office. No doubt he was made to memorize Cullen's "Practice of Medicine" and other textbooks then in vogue but, judging from the notes in my possession, he was also put to the task of writing up cases which occurred in the practice of his uncle. I have one note-book containing "Notes from Cases of Surgery which have occurred in the Practice of Dr. P. S. Physick, by John Syng Dorsey, 1798-99." Thus reads the title page. The notes are written in a boyish hand but compiled with great care. Some are illustrated. Here is a record of the first case:

July 21, 1798. Visited a patient of the Pennsylvania Hospital of about 30 years of age, John Altery, who informed me that two or three years ago he received an injury on his shin which caused an ulcer to form itself there. The ulcer at first was trifling, but by means of ill-treatment increased to a large size. When I saw it, it was about 7 inches in length and 5 in breadth, and appeared healthy except in one place, where a piece of the tibia as big as a quarter of a dollar was bare and carious. He informed me also that several pieces of the shin bone had come away. The tibia was much enlarged. It was thought that the ulcer had been prevented from healing by the carious bone and that it was impossible for it to heal till all the carious bone should be removed. It was proposed by Dr. Physick and advised by Drs. Shippen, Wistar, and Physick to save the limb by cutting off and dissecting out the diseased part of the tibia, under an idea that new bone would form itself in place of the diseased. The man would not consent to the operation but preferred having the limb cut off, which was accordingly done this day in the following manner: The patient being placed in a convenient situation, a pad of lint was placed over the femoral artery and secured by a bandage over which the torniquet was applied. An incision was then made through the skin and cellular membrane about 4 inches below the knee. The incision was oblique, being 2 inches lower behind than before,—they were then dissected from the muscles so far up as to afford a sufficient flap to cover the extremity of the stump. The muscles were then divided down to the bone, and the interosseous muscles were cut with a catlin. The tibia and fibula were then sawed off and the stump dressed. A bandage was rolled round the femur to the knee over which two slips of adhesive plaster were applied: one reaching from the external condyle of the os femoris under the ham across the stump on the interior side of the tibia to the same of the patella; the other from the internal condyle down the ham over the other slip and across the stump on the internal side of the tibia to the same of the patella, bringing the anterior and posterior flaps in contact. Pledgets of cerate were then applied to the cicatrix, which were covered by a large plaster of ton spread with Ungt. Basil, which were bound round the stump with bandage.

The diction in this report is simple, the composition is likewise that of a schoolboy but withal the description is clear and accurate, presaging the future author of the first important American text-book on surgery. The report of the second case, that of a 4-months-old child afflicted with hydrocephalus, is dated December 25 and contains a very good illustration of the instrument with which Dr. Physick performed the operation. The note-book ends with an index which enumerates the following subjects:

1. Case of amputation in the Pennsylvania Hospital, July 21, 1798.
2. Case of hydrocephalus, December 25, 1798.
3. Case of dissection of an ulcerated cancerous tumor from the eye of a person near 70 years of age.
4. Case of dissection of a thick membrane from the eye.
5. Case of aneurism of the popliteal artery—in the Pennsylvania Hospital.
6. Case of fractured femur.
7. Case of dissection of an encysted tumor from beneath the eye.

8. Case of amputation of thigh.
9. Case of extraction of cataract.
10. Case of operation for the cure of hydrocele.
11. Case of excision of a cancerous underlip.
12. Case of extraction of cataract from each eye of a lady.
13. Case of extraction of cataract.
14. Case of operation for fistula lachrymalis.
15. Case of dissection of tumor from the breast.
16. Case of injury of the head.
17. Case of extraction of cataract.
18. Case of amputation of cancerous mass.
19. Case of operation for radical cure of hydrocele.
20. Case of dissecting off a large cancer from the cheek.
21. Case of amputation of the leg below the knee at Pennsylvania Hospital.
22. Case of polypus.
23. Lithotomy on a child two years old.
24. Varicose veins secured by ligature.
25. Lithotomy on a young man.
26. Trepaning.
27. Hydrocele—cured.
28. Amputation of cancerous mamma and tumor in axilla.
29. Harelip.
30. Tumor from eyelid.
31. Case of divided radial artery secured by ligature.
32. Case of injured head which ended fatally after symptoms of compression. No fracture found.

These cases young Dorsey observed, studied and recorded when only a lad of sixteen. When he entered on his studies at Pennsylvania University he evidently had no time to record cases, for the next record is dated 1801, or one year before graduation. I have reason to believe that he made no records from 1789 to 1801. In a case-book I have we find records of interesting cases compiled at a later date. These records are not dated consecutively, one which occurred in 1802 appearing before one dated 1801, the latter being the earliest date mentioned. Had there been any records prior to this date they would no doubt have been included.

This book reveals in the young student the power of observation and analysis which made Dorsey famous in later years. Thus, in recording a "Case of Fractured Skull, cured by Trephine," October 9, 1801, Dorsey remarks:

> This case appears to prove that some portions of the brain are capable of being pressed upon considerably without much influencing the intellectual operations. Daniel (the patient) was not stupid, delirious, nor convulsed from pressure on the brain, but on the 3d day (Oct. 12) the inflammation produced some delirium. In other cases of injured head a trifling pressure on the brain or indeed a fissure without perceptible depression produces coma, convulsions, delirium, vomiting, etc. It further proves the propriety of the depleting plan with a view not merely to relieve but to prevent usual alarming symptoms of compresed brain.

This report is accompanied by a very good illustration of the size and shape of bone removed.

The other reports covering the same period are no less interesting and the remarks no less pertinent, but it would take too long to quote them. I will only quote one more. A very interesting case of hydrophobia in a boy 7 years old which occurred September 15, 1802, is commented upon in the remarks as follows:

> Whatever inferences may be drawn from the circumstances of the above case, with respect to the inflammatory nature of the disease it appears to me to prove beyond doubt that it kills by producing spasm of the glottis. To have performed tracheotomy at the late period of the disease when Dr. Physick was called, would not perhaps have been prudent. The patient had then no pulse or scarcely any. His extremities were cold—add to this his age (seven years) was such as would not allow of the instrument necessary to be left in the trachea, to have remained there,—he would certainly have pulled it out and died suffocated. This is not mere opinion for Dr. Shippen relates a case where tracheotomy was performed to relieve cyanosis trachealis and death was produced by the patient pulling out the cannula from the trachea.

That young Dorsey had received recognition a year before graduation is attested by the following certificates: One from the Medical Society of Philadelphia, signed by Benj. Rush, president, showing that Dorsey became a member of that society in 1801. The second, issued by the Chemical Society of Philadelphia, reads:

> Desirous of promoting the cultivation of the Science of Chemistry in the United States of America, by associating with themselves persons of distinguished talents, have elected John Syng Dorsey a member of the said Society, hereby granting him all the privileges thereunto belonging.

In 1802, the year of graduation, Dorsey received a certificate from the attending managers and physicians of the Pennsylvania Hospital to the effect that "he hath attended the Practice of the Physicians of the said Hospital for four years." This certificate is signed by Sam'l Coates and Lawrence Seekeb, sitting managers, and Benj. Rush and Philip Syng Physick, attending physicians.

In November, 1803, young Dorsey sailed for Europe with the intention of spending his time in the then two great medical centers—London and Paris. London was familiar ground to Dorsey. There lived and worked John Hunter, and it was in Hunter's private dissecting room that Dorsey's uncle distinguished himself as an apt pupil, having received from his master the very flattering offer of partnership. Moreover, in London, young Dorsey was received by Sir Everard Home, a brother-in-law of Hunter, a fellow-student of Dr. Physick, and at the time of Dorsey's visit, a distinguished surgeon. Upon his arrival Dorsey at once plunged into hard work. He attended lectures, visited hospitals and took courses in anatomy, physiology, pathology, and surgery at William Hunter's Theatre of Anatomy.

A certificate from that institution reads:

> These are to certify that John Syng Dorsey, M. D., hath attended our lectures on Anatomy, Physiology, Pathology, and Surgery during one course with great diligence and one course of dissection. Signed: James Wilson and W. Leigh Thomas. Dated, London, May 19, 1804.

The same year he went to Paris where he attended lectures and visited hospitals, devoting apparently but little time to the Latin Quarter and similar attractions, and in October, 1804, returned to Philadelphia and opened an office. For the first few years notwithstanding the help which he received from his uncle, the reputation which he had already acquired

and his affable manner in dealing with his patients Dorsey's practice from a financial standpoint was hardly remunerative. The first year his income was $325.75, the second $924, including $100 which he received from Dr. Physick for spending 10 days in Baltimore with a patient, $50 from a private pupil and $45 from the sale of catheters. The income, however, kept increasing until, in 1817, the year of his untimely death, it amounted to $10,199. Dorsey's annual income, however, was not altogether from practice. His private pupils, of which he had 61, from 1807 to 1817, brought him from $50 to $200 each. For his lectures on surgery and afterwards on materia medica he received $1000 a year, and for his book on surgery $2000. But withal he had what in those days may well be considered a lucrative practice. However, in the early years of waiting, he was not idle, but assisted Dr. Physick in his operations, recorded assiduously that doctor's and his own interesting cases, attended medical meetings and devoted whatever leisure he had to music and poetry. Dorsey was not a poet but he wrote good verse and what is more on deep subjects, for his mind was never frivolous. His first recorded verse was made on a fine summer evening in 1805, when

> With tints far richer than of Tyrian dye,
> The Sun declining paints the Western sky.
> Lost [was] the splendour of his noon-tide blaze,
> Lost the effulgence of his evening rays.

But the man of two and twenty was thinking then of the destiny of man, and plaintively:

> 'Tis so with man;—he rises from the womb,
> Then shines a while, and sinks into the tomb.
> Alas! how few who to their zenith rise,
> And all their course pursue thro' cloudless skies.
> Vapours and mists that rising from the earth
> Obscure the sun receive from him their birth.
> 'Tis so with man, the ills that cloud his brow,
> And all his mis'ries from his follies flow.

Love also urged his pen, for following the above are two lines "written at the urgent request of a lady":

> Two lines I write;—enough to prove
> That writing less than thee I love.

To which his son Robert Rahlston Dorsey irreverently added in 1854:

> And I must make your two lines four
> By wishing you'd loved writing more.

In the same year Dorsey wrote a poem called "Reflections on the Incomprehensibility of God," a very profound and lengthy discourse, also the "Invocation to Oblivion," "Advice to a young Lady," "A valedictory address to my Muse" and a "Song sung at the Anniversary Dinner of the Philadelphia Medical Society" in which he declares:

> With Rush I like bleeding, because I am right sure
> There are fifty diseases the lancet can cure,
> But the tapping a vein I'd with pleasure resign
> For the pleasure of tapping a hogshead of wine.

This was his last verse until in 1815 he again mounted his Pegasus.

In 1807, when only 24, Dr. Dorsey was appointed adjunct professor of surgery at the Pennsylvania University at the request of Dr. Physick, who then occupied the chair. This request came in the form of the following communication:

To the Trustees of the University of Pennsylvania.

GENTLEMEN: In consequence of being afflicted with an infirm state of health and thereby sometimes rendered unable without much suffering to fulfill the duties of my professorship of Surgery with punctuality I am under the necessity of requesting that you would do me the favor of appointing my nephew Dr. John Syng Dorsey to assist me in the Capacity of a Colleague or Adjunct Professor—In favor of his qualifications for that Station I shall only add (without saying anything of his talents) that he has been my assistant in the Surgical part of my business for nearly ten years and that I have the fullest confidence in deriving all that assistance from him which my bad state of health and frequent indisposition require.

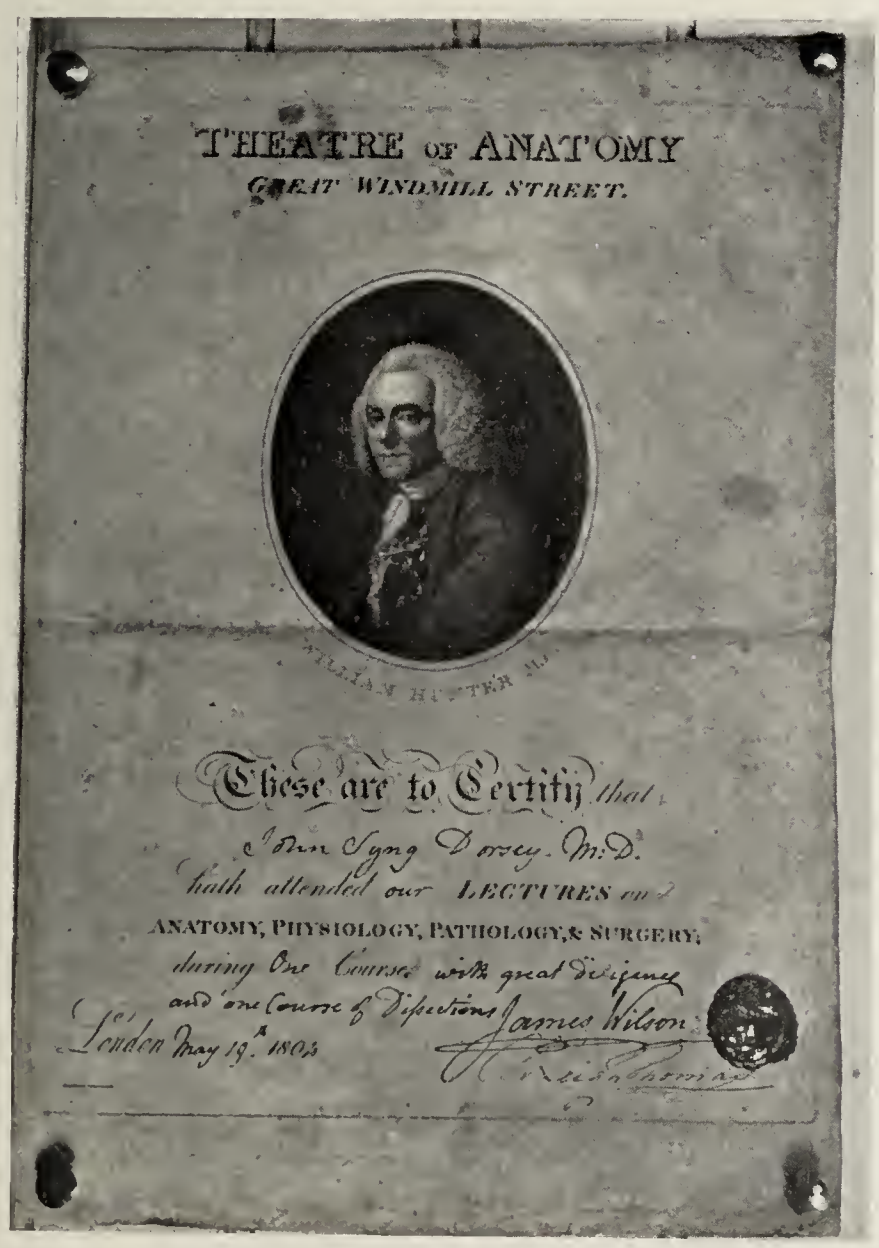
Dr. Dorsey does not expect to attend the meetings of the Medical faculty or examinations of candidates for degrees. Of course the expense of graduation will not be increased.

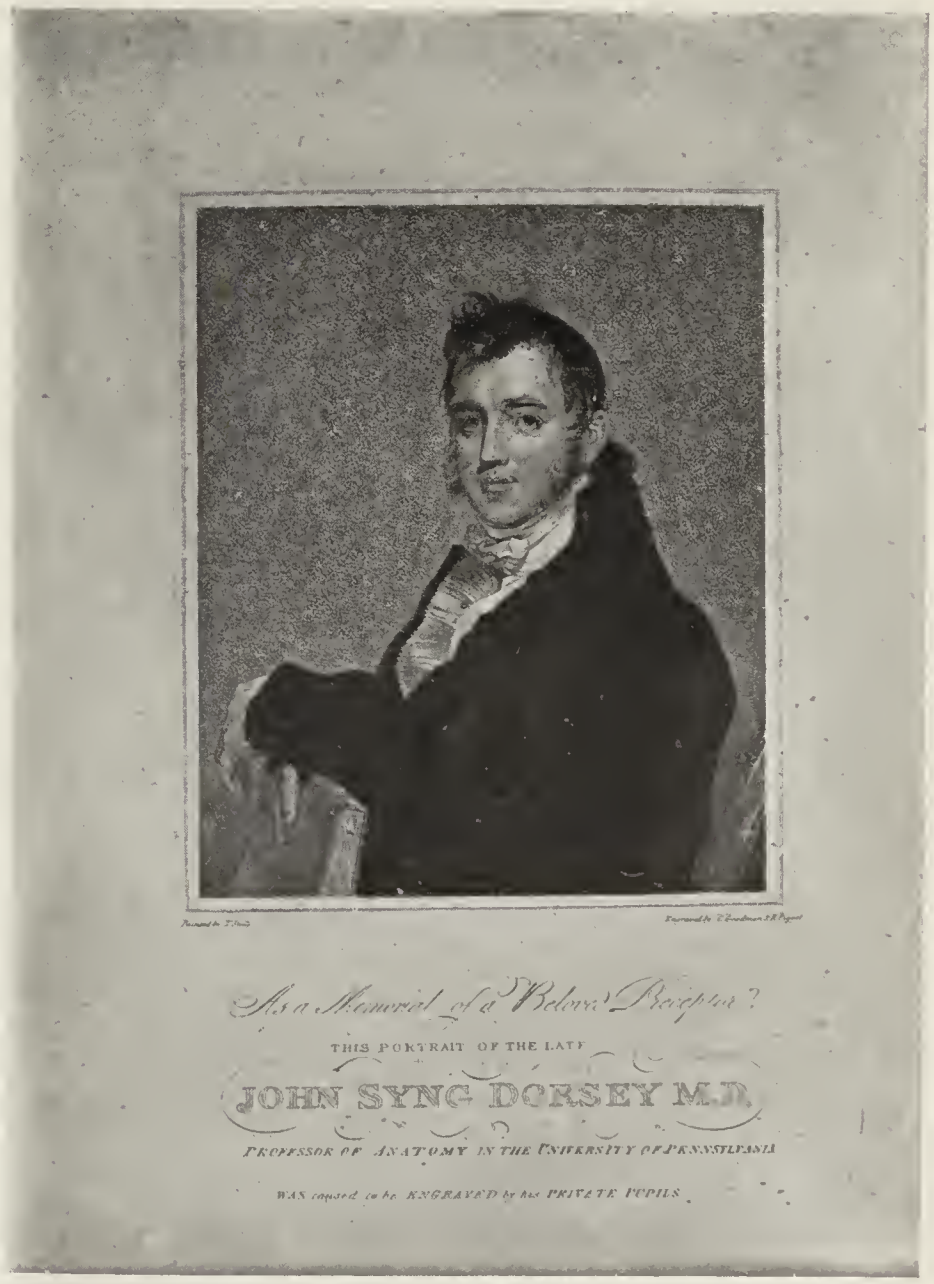
This request was granted on October 14, 1807. As a side light on the life of Dr. Physick it is noteworthy that despite his ill health, resulting from two attacks of yellow fever, he was able to rise above his infirmities and mount the pedestal of fame. Thus man's spirit masters his physical being!

The young adjunct professor discharged his new duties with a thoroughness and ability which soon made him popular among his students: his whole soul was wrapped up in his chosen calling and no claims, even those of music and poetry, were superior to those of his profession. In the same year in which he became adjunct professor he married a charming and highly-cultured young lady, Maria Ralston, daughter of a prominent Philadelphia merchant. However, Dr. Dorsey's new obligations, family as well as social, were not permitted to interfere with his work. He prepared and delivered his lectures, assisted his uncle in operations and performed some himself, recorded all the interesting cases in his uncle's and his own surgical practice and in 1813 became the author of two volumes of the "Elements of Surgery," illustrated mostly by himself. This work received wide recognition, being reprinted at Edinburgh and used as a text-book at that university. In it Dorsey reflects the greatness of his uncle, of whom it has been said: "Nihil tetigit quod non ornavit." Dorsey has not had time to acquire independent experience but he had the remarkable faculty of assimilating the experience of others. "The American surgeon," he said, "is or ought to be strictly impartial and therefore adopts from all nations their respective improvements."

Dr. Physick had contributed perhaps more than any other man to the improvement of surgical technic and his improvements Dorsey faithfully adopted, having no doubt assisted his uncle in the elaboration of many of them. Dr. Physick's gorget has been described by Dorsey in his book and mentioned in his notes. Desault's splint had been modified by Physick; he also devised the angular splint for fracture of the humerus; the curved forceps for taking up deep-seated arteries; an improved method of treating artificial anus; of introducing a catheter in cases of retention of urine; a new method of re-

Societas Medica Philadelphiensis
ANNO DOMINI MDCCLXXXIX CONSTITUTA
Omnibus qui haec legerint
Salutem.


THEATRE OF ANATOMY
GREAT WINDMILL STREET.
WILLIAM HUNTER M.D.
These are to Certify that
John Syng Dorsey M.D.
hath attended our LECTURES on
ANATOMY, PHYSIOLOGY, PATHOLOGY, & SURGERY;
during One Course with great Diligence
and one Course of Dissections James Wilson
London May 19th 1803


As a Memorial of a Beloved Preceptor
THIS PORTRAIT OF THE LATE
JOHN SYNG DORSEY M.D.
PROFESSOR OF ANATOMY IN THE UNIVERSITY OF PENNSYLVANIA
WAS caused to be ENGRAVED by his PRIVATE PUPILS

Societas Linnæana Philadelphiensis

Scientiæ Naturales Cultoribus

SALUTEM.

Virum ingenuum et eruditum Johannem Eyng Dorsey M.D. SOC. MED. PRESID.

quæ ad communes Literas, Artes, Studia, Naturæ optime investigata, Societatem Linnæanam nostram scientiis dignissimis et constituimus, atque omnia scientiæ nostræ hora in Paradisum inseramus. Itaque omnes tenarum Literarum et Artium Studiosos erudite rebimus ut quam Gratum Observationum commune has Scientiarum exemplar scientiæ hanc nostro libenter faciant. Datum Philadelphiæ die 20 Junii

Anno Æræ Christianæ MDCCCXVI.

Gulielmus N. Boston M.D. Præses

P. Mc Gallister Sec. Vice præs.

Edward B. Tucker M.D.

Gualterus J. Schott M.D.

Societas Medica Philadelphiensis

Anno Domini MDCCLXXXIX Constituta

— Omnibus qui hæc legerint —

Salutem

Vir ingenuus et eruditissimus John Eyng Dorsey Socium Primum — quem in numerum nostrum recepimus, cujus ingenium felicissimum et diligentia indefessa semper nobis oblectamento fuere has literas libentissime donamus atque cum omnibus Philosophiæ et Medicinæ cultoribus solicite commendamus. In quorum testimonium sigillum nostrum cum nostrum Præsidis subscripto præsentibus apponi fecimus

Datum Philadelphiæ, die February 26th Anno Domini 1810

John D. Betton M.D. Præs. Benjamin Smith Barton M.D. Secr.

WE The attending Managers and Physicians OF THE

PENNSYLVANIA HOSPITAL,

Do Certify That John Eyng Dorsey Student of Medicine of the City of Philadelphia hath attended the Practice of the PHYSICIANS of the said HOSPITAL for Four Years

In Testimony whereof We have respectively set our Names to this Certificate and caused the Seal of the Hospital to be thereunto affixed this Twenty First day of May in the Year of our Lord

Managers

Physicians

PENNSYLVANIA HOSPITAL.

This is to certify, That John E. Dorsey M. D. of Philadelphia hath contributed the Sum of Fifty Dollars to the Pennsylvania Hospital, and is one of the Corporation of Contributors, and vested with the Rights, Powers and Privileges of a Contributor to the said HOSPITAL.

Witness my HAND, and SEAL of the CORPORATION, this First day of October 1817

Joseph S. Lewis Treasurer.

PHILADELPHIA: PRINTED BY JOHN WARD FENNO, NO. 119, CHESNUT-STREET.

ducing dislocation of the thigh; and he was the first to apply animal ligatures to secure the vessels in amputations (1814).

In 1813 Dorsey became professor of materia medica at the University of Pennsylvania, a position which admitted him into the faculty. This position he filled with singular ability until 1818 when he was appointed to the chair of anatomy made vacant by the death of Dr. Wistar.

Having thus risen to eminence at the age of 35 it would seem that Dr. Dorsey had before him a life of comparative ease and a great deal of usefulness. His own poetic vision must have conjured a delightful picture of a happy useful life, one full of interest, amidst grateful patients, devoted friends and admiring pupils, but while the words of his brilliant introductory address were still fresh in the minds of his hearers Dr. Dorsey was dying from an attack of typhus which developed the evening of the same day in which he delivered his last lecture.

The last verses Dr. Dorsey wrote shortly before his death show the agony of soul upon the brink of the great Unknown:

There is a moment hastening on
  When I must bid this earth farewell.
When all my numbered moments gone
  My soul must steer for Heaven or Hell.
At that dread hour how shrinks the soul;
  The body trembles, too, with dread.
Long joined, one sympathetic whole,
  The man must mingle with the dead.
The dead! Oh, what mysterious change
  Does death inflict on Adam's race.
Through what unheard of scenes of range. . . .

This cry was cut short, perhaps, by increasing weakness, for the last stanza ends abruptly, but imbued with deep religious convictions Dr. Dorsey passed the last moments of his life in religious talk with Dr. Janeway, who thus describes the death-bed scene:

On approaching his bed at the head of which his mother was sitting, Dr. Dorsey taking hold of a button on my coat, thus addressed me: "Doctor, is it not remarkable, after having delivered my introductory lecture, I was praying to my God, that He might not postpone my repentance to a dying bed; and *in one hour* after that prayer I was smitten with my disease."

The large room in which the doctor lay on his sick-bed was filled with ladies and gentlemen. There were present Doctors Physick, Chapman, and Hornes, Mr. Ralston, and several medical students.

Dr. Dorsey then made a request to be baptized, which was done by Dr. Janeway. His last words were: "I have a desire to live and remain with my family; but my desire to be with Christ is far greater."

Thus died a man who, had he lived longer, would, perhaps, have equalled Hunter or Wistar; a man in whose untimely death medicine lost perhaps more than we can estimate; a man whose short life was so remarkable for its varied and useful activity as to ensure his being remembered. What was it which made him famous at an age when many a man only dreams of fame? It was not inherent ability alone, for many an able man is passed by unrecognized. It was not personality, for many an amiable and generous man lives and dies unnoticed save for a few intimate friends. It was not erudition for he had not yet contributed anything of importance to science. It was not skill as a surgeon for he had not had time to surpass his uncle, Dr. Physick, and there are any number of successful surgeons whose names do not appear in biographies of great men. No, he embodied in his life work the three fundamental principles of success: Singleness of purpose, devotion to duty and untiring effort. When these are combined with natural talent fame is the invariable result. It is work that makes the successful man. It is untiring, unremitting effort that enables one to achieve the results which alone attract attention. Talent, nay genius, without work is like a fertile field that is not cultivated—it differs from a barren desert only in its possibilities. In his introductory address on anatomy Dr. Dorsey, speaking of himself, said:

The present incumbent is well aware that much strength must be necessary to flex the bow of Ulysses; yet he ventures without affectation or diffidence to attempt it and not without a hope that at a future day he shall have achieved by diligence some better claims to his present distinction. All he can even promise is his honest, zealous, and unremitting effort to discharge those duties heretofore performed by men whose memories are embalmed in the heart of every votary to medical science and whose glory, no longer in its zenith, still casts some lingering beams around the horizon, once illuminated by their noontide splendor.

It is this honest, zealous, unremitting effort that has characterized Dr. Dorsey throughout his life and has made him famous.

STUDIES IN GENITO-URINARY SURGERY

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INTESTINAL ANASTOMOSIS WITHOUT OPEN INCISIONS BY MEANS OF BASTING STITCHES.

(Illustrated.[1])

By Edward Mason Parker, M. D.,

and

Harry Hyland Kerr, M. D., C. M.,
Washington, D. C.

The fact that from five to ten new methods for intestinal anastomosis continue to be described each year is itself strong evidence that the perfect way has not yet been found. The very multiplicity of methods, therefore, furnishes an excuse for suggesting still another, but at the same time it increases in proportion the obligation to make good. Only the best of reasons can justify the addition of one more to the long list, especially since in recent years the technic of intestinal anastomosis, long in a very chaotic condition, seems to be approaching the uniformity and precision of an established method. As Monroe has said, "The simplicity, cleanliness, rapidity and safety of the clamp and suture operation are strong arguments at the present time against any substitutes."

But if the question be asked in what way can the present methods in intestinal operations be improved upon, an obvious answer presents itself. The way to improve the technic of operations for intestinal anastomosis is to eliminate the open incisions. Two separate and entirely different considerations point directly to this conclusion. These relate to what may be called the two general requirements in intestinal surgery: namely, asepsis and facility in operating.

No argument is needed to show that a gaping intestinal wound introduces a serious difficulty into the aseptic problem. Whenever the intestinal lumen is opened, or even when an instrument or ligature is passed into it, and out again, soiling of the peritoneum with at least minute portions of intestinal contents, swarming with bacteria, is almost inevitable. Although we are accustomed to good results in suturing gunshot and other open intestinal wounds, where we are compelled to rely upon the natural resistance of the tissues to infection rather than upon the maintenance of aseptic conditions, we are not therefore justified in introducing this complication into all intestinal operations, if it can be shown to be unnecessary, for the danger from operative soiling is a real one and is clearly unavoidable in the presence of an open incision.

The conclusion is almost equally clear when we consider the question of facility. To meet this requirement a vast amount of ingenuity has been exercised in the invention of mechanical devices of which the Murphy button is the most brilliant example. The disadvantages of methods of intestinal suture without mechanical aids, have been most clearly stated by Halsted. These are briefly: length of time and number of assistants required; vermicular action of intestine and rolling out of mucosa, preventing accurate disposition of stitches and recognition of precise edges; difficulty of adjusting pieces of intestine not of the same size; excessive handling of the intestine tending to injure the peritoneum and predispose to infection. Every one of these difficulties, with a single exception, which will be presently shown to be apparent rather than real, is evidently due to the presence of the open incisions.

It is the object of this paper to present a preliminary report, based upon some experimental operations upon dogs, of an attempt to find a way out of this difficulty which confronts us in each of these two widely different problems.

The suggestion which we have to offer does not depend upon any new principle or require the use of any ingenious new instrument or stitch. It is rather a simple and almost obvious application of old and well-tried methods in a way which appears to us to solve the problem of the open incisions. It may be defined as an easy and rapid method of suturing, applicable to every form of intestinal anastomosis, whether circular, lateral or end-to-side, whereby the immediate formation of a patent stoma may be accomplished without operative opening of the intestinal lumen, and without the introduction into it of any instrument or ligature.

An almost incredible number of methods for suturing the intestines have been suggested. F. G. Connell in 1899, reviewing the methods to that date, enumerated no less than one hundred and twenty without exhausting the list. Our search of the literature up to the present time has been rewarded with over eighty more. Many of these of course are based upon identical principles showing only slight and unimportant variations, as for example, many of those among the large class of bobbins of decalcified bone or other material. All of them, however, deal specifically with the problem of uniting intestinal wounds, other variations in operative procedures not being included in the list.

Among these approximately two hundred methods of intestinal suture which have been suggested or tried there are some twenty-five in which the object aimed at has been to eliminate more or less completely, at least during some of the steps of the operation, the open intestinal incisions.

These methods fall naturally into two classes. First, those in which an immediate opening is formed and second, those in which the new stoma is intended to be established by pressure necrosis after a variable interval.

[1] We desire to express our thanks to Dr. W. M. Gray for the photographs.

In the first class there are two divisions; (a) those in which all the sutures are first placed and most of them tied, the incision being made at the last moment and the final sutures then tied. This division embraces the methods by Halsted, Ferguson, Lundholm, Gilbert, Werelius, Flint and Baumgartner; but all of them apply only to lateral anastomosis, so that when a resection is done there still remain the open incisions of the divided ends.

The second division of this class (b) includes those in which the incisions are made at the beginning and are kept closed by a clamp or other device while the sutures are being applied. Such are the methods of Laplace, Downes, and Keefe, which apply to circular suture; the method of Graser, which applies only to resection of portions of the stomach without anastomosis, and those of O'Hara and Rostowzew, which apply to all anastomotic operations. All these depend upon the use of special clamps, and, in all of them except those of Graser and Rostowzew, the instrument enters the lumen of the intestine at some time during the procedure. This division includes also the method with hairpins of French, and the method with knitting-needles of Pleth.

In the second class, in which the new stoma is to be formed by necrosis after an interval of several days, the best-known means are the McGraw elastic ligature and the twine triangular stitch of Maury. Other similar ligature methods are those of Postnikow, Knie and Podrez. Here also belongs a recent method by Senn in which a clamp instead of a ligature is used.

Of curious, rather than practical interest, are those methods reviewed and revived by Sato in 1904, in which intestinal walls are stitched around an area devitalized by the thermocautery (Bastianelli, Chaput, and Powel) or by crushing followed by cauterization with a chemical substance (Souligoux) or even around a cauterizing substance in the form of a tablet (Boari). All the methods of this class of course apply solely to lateral anastomosis, and open incisions have still to be dealt with where portions of the bowel are resected.

It may be noticed that all but seven of these methods are limited to lateral suture. Of these four apply only to circular suture, one is not an anastomotic operation, so that only two, those of O'Hara and Rostowzew, are applicable to every form of anastomosis. In but one of these methods (the last named) is absolute exclusion of communication with the intestinal lumen maintained throughout every step of the operation.

The procedure to which we wish to call attention is an extremely simple one. It consists essentially in the use of a Cushing continuous stitch, without knots, to temporarily close the intestinal incision, a separate stitch being used for each of the two visceral openings that are to be sewn together. These stitches remain in place only while the permanent sutures are being applied. On account of their method of application and the temporary purpose which they serve, they bear a certain likeness to the "basting" stitches of the seamstress, and for convenience we have called them by that name.

The steps of the operation and the advantages which we believe it to possess may be briefly summarized as follows:

Division of the intestinal walls is made between two narrow-bladed crushing clamps, placed first in actual contact and then slightly separated so that there is left between them a narrow crushed area, consisting practically only of serosa and fibrous coat, which may be divided by the knife or cautery.

The basting stitch is a Cushing continuous stitch without knots, placed upon the clamped incision with the loops between the stitches crossing over the blades of the clamp. When the clamp is removed and the stitch at the same time drawn tight, the edges of the incision are automatically inverted and held firmly pressed together in a straight line without any separation of the lips of the opening having occurred. The two incisions, so prepared, are then placed side by side, and are stitched together around the whole circumference of the intestinal tube or of the new operative opening that is to be established. When the last suture has been placed and tied, the basting stitches are cut short and withdrawn, the intestinal canal, or the new anastomotic stoma, then instantly becoming patent. This completes the operation as far as the suture of the intestines is concerned. The lumen has not been opened and it has not been entered by any instrument or other object. The stoma becomes open only with the withdrawal of the basting threads. The steps of the operation are essentially the same whether circular, lateral or end-to-side anastomosis is done.

The operation so performed calls for no time-consuming maneuvers and no more than ordinary manipulative skill. The basting stitches are as easily and as quickly placed as the purse-string suture used to turn in the stump of the appendix or grasp the Murphy button. Upon removal of the clamp, the stitch is at once drawn tight by a single motion and the incision, securely closed in a straight line, is then ready for suturing without further attention. The turning of the cut edges which takes place is automatic and never requires the use of an instrument to assist it as in the case of the purse-string suture.

With the two basting stitches in place, intestinal suture at any rate in dogs, becomes singularly free from its usual difficulties. Only a single assistant is ever needed, and even he may be readily dispensed with. The parts to be joined are held in the most convenient position and under perfect control, so that the stitching is done with surprising rapidity and ease.

The troublesome eversion of the mucosa and the vermicular contractions of the muscular coats no longer exist. Approximation of serous surfaces to any desired extent and at a uniform distance from the margins of the incision is assured. The inversion of the cut edges presents a folded wall through which to pass the stitches making precision in their application, with secure anchorage in the fibrous coat, particularly easy.

Handling of the intestines is reduced to a minimum. The hands of the operator need scarcely touch them, and those of the assistant not at all.

In end-to-end suturing the small triangular peritoneal defect at the mesenteric border is automatically obliterated

by the basting stitch insuring apposition of serous surfaces at this point.

A striking advantage of the method is seen when the two incisions to be joined happen to be of unequal length. In this case the longer one is simply puckered or "gathered" in upon its basting thread until it corresponds in length with the shorter incision and the sutures are then applied. We have successfully united in this way without the slightest difficulty intestinal incisions, one of which was double the length of the other.

In the beginning of the experimental tests of this method a single discouragement was met with. This occurred in the first three operations upon dogs, done on three consecutive days, the animals dying of obstruction due to turning in too much of the intestinal wall. This is the one fault to which the method may easily lend itself if the operation is carelessly done, but one which it is equally easy to avoid. It is practically only in dogs of small size, or in young children, with intestines having a very small lumen and relatively thick walls that this danger applies. At any rate our subsequent success even with dogs of the same size demonstrated, at least to our own satisfaction, that these initial failures were not due to a fault inherent in the method.

For a more detailed description of some of the steps of the operation which is necessary it will be sufficient to take the classical example of end-to-end suture after resection.

At each point where division of the intestines is to be made two parallel clamps grasp the flattened tube transversely or at an angle from the free border to the mesenteric border. The method of dividing the intestinal walls between these clamps has already been described. Circumvection ligation of the mesenteric vessels going to the portion to be resected and removal of that portion follow. There remain then the two intestinal ends that are to be joined, each closed by a strong clamp. The intestinal walls have been divided flush with the blades of the clamp so that no tissue whatever projects.

The next step is the application of the basting stitches. Holding the clamp in his left hand the operator enters the first bite of the stitch on the side of the flattened intestinal tube facing him, close to the mesenteric border, at the point where the peritoneum begins to be reflected away from the bowel wall. This first bite of the stitch is taken parallel with the axis of the intestines and in a direction toward the clamp emerging about 1 mm. from its edge. Now turning over the clamp the thread passes over its blades and the second bite of the stitch is taken in the opposite side close to the mesenteric border as before, but this time parallel with the blades of the clamp and about 1 mm. from its edge. These first two stitches are most important since by them the mesenteric angle is turned in obliterating the peritoneal defect at this part of the incision. The third, fourth, and following stitches are exactly like the second and are taken alternately, first in one side, and then in the opposite side, until the free border is reached. The last bite of the stitch, taken in the free border, is again like the first bite, parallel with the axis of the intestine but this time taken in a direction away from the clamp, entering about 1 mm. from its edge. Thus the first and last stitches in the mesenteric and free border respectively, are parallel with the axis of the intestine. All the intervening stitches are parallel with the blades of the clamp and as close as possible to its edges. All the loops of the stitch pass loosely over the blades of the clamp.

It will be seen that this is simply a Cushing right-angled continuous stitch, since all the individual stitches on one side of the incision correspond with intervals between stitches on the opposite side, exactly as in the Cushing stitch.

Both ends of the basting threads are left eight or ten inches long. No knots are tied. We use medium heavy white silk for the basting threads to distinguish them from the black silk used for sutures. A straight or curved intestinal needle may be used as preferred.

The clamp is now loosened and carefully drawn from under the loops of the stitch. The thread is grasped, one end in each hand, and by separating the hands strongly is made taut, the effect being to produce instant and automatic inversion of the edges and secure closure of the incision in a straight line. Both mesenteric and free borders are inverted as well as the lateral walls.

When the crushing clamp grasps the intestinal tube it pushes aside the mucous membrane on the inside and the two muscular coats on the outside, leaving practically only fibrous coat and serosa between its blades. When the clamp is removed there is seen a narrow ridge of crushed tissue consisting of these coats of the two intestinal walls glued together by the pressure to which they have been subjected. Even in the dog's intestine with its thick muscular coats, the lips of the incision do not separate during the few seconds intervening between the removal of the clamp and the pulling taut of the basting stitch. Unless this is purposely delayed, allowing time for the vermicular action of the muscular coats to pull apart the edges, the mucous membrane is never seen.

The other end of the divided intestine having been prepared in the same way, the next step is the uniting of these two ends by sutures. The assistant grasps the long free ends of the two basting threads, those from the mesenteric borders in one hand and those from the free borders in the other, and holds the two threads taut and parallel with each other, adjusting them so that the two intestinal ends, hanging from the middle of the threads between his hands, unite mesenteric border with mesenteric border, and free border with free border. It will be seen that when the two ends of the flattened tube are so held there are four intestinal walls lying in contact with parallel edges.[2] A detailed description of the application of the sutures is unnecessary. Almost any form of a stitch may be used. Turning the corners presents no difficulties. Two precautions are essential—not to cross the line of the basting thread with any of the stitches and not to catch the basting

[2] In operations upon dogs we have sutured usually the two inner walls first (Fig. 6), but in the thinner walled human intestine it would be easier to begin the suture by bringing the two outer walls in apposition (Fig. 7).

thread itself with a stitch. When the permanent stitching is finished and the basting threads have been cut short and withdrawn, the intestinal tube is rolled between the fingers at the suture line to make sure that the lumen is patent.

We do not desire to recommend any particular form of suture to be used exclusively in this method. We feel sure, however, that the general preference for a continuous stitch in circular suture of the intestine is well founded. The tension to which intestinal stitches are subjected under ordinary conditions comes almost wholly from internal pressure in the intestinal tube. In hydrostatics the law which applies to such a case is that, in a thin-walled tube subjected to internal pressure, the circumferential strain upon the walls of the tube is double the longitudinal strain. As applied to circular suture of the intestines this means that the longitudinal strain which tends to pull the edges of the incision apart, equals only half of the circumferential strain which tends to tighten the stitch if a continuous suture has been used.

Hemorrhage in intestinal operation is not likely to give trouble with this method, but it would be unsafe to conclude that it might not do so in operations upon the human stomach, and therefore the method is far from having been sufficiently tested to be recommended for that work.

The assistant may be altogether dispensed with. The operator in that case passes the long basting threads over the thumb and index finger of his left hand with the two intestinal ends hanging between them, the ends of the threads being twisted around the little finger to hold them taut.

It is possible to put in the basting stitches before instead of after the incisions have been made, but the method does not seem to us to have any advantages over the one described.

An attempt to show how quickly any procedure may be carried out in an experimental operation seems unprofitable and misleading, we have therefore never tried to make a record. Working deliberately and doing each step with painstaking care, we find, comparing a number of trials, that the application of the two basting stitches, removal of the clamps, and drawing taut of the threads, requires about four minutes. A single continuous stitch around the circumference of the stoma takes about four or five minutes more, so that the time required for the intestinal suture proper may be placed at about ten minutes. This leaves out of account the time required in the resection, and in opening and closing the abdomen.

In the following fifteen observations, dogs ranging in weight from 13 to 30 pounds were used. They were all thoroughly anesthetized with ether. The after treatment consisted of fluid diet after twenty-four hours, and chopped meat after two or three days.

The specimens were examined from three to 100 days after operation and a fair idea of the process following the suture could be obtained. In no case was there any leakage. In the first three cases a solid septum had formed from the careless turning in of too much tissue. This was never encountered again. In experimenting by this method with calves' intestine or dead human intestine, where the lumen is large and the walls proportionately thin, the turned-in edge was not more than one-eighth of an inch wide and offered no stricture or possibility of obstruction. In one case examined three days after operation the turned-in edges had atrophied to a fine fringe of tissue one-sixteenth of an inch wide. Two others in which a transverse end-to-end anastomosis had been made, some stricture with dilitation and hypertrophy was found. This was first noted by Edmonds and Ballance in 1896 and advanced as an objection to end-to-end anastomosis. In the subsequent cases this was entirely done away with by using the oblique incision. Stricture, hypertrophy or dilatation have never been found following this procedure.

OBSERVATION No. 1.—End-to-end anastomosis. (5-17-07) 23-pound dog. Ether anesthesia. High median incision and a loop of small bowel delivered. Clamps (blades ¼ inch wide) applied transversely to the bowel axis and 4 inches of gut excised. Basting stitch of white silk, parallel to the clamps and ⅛ inch from them. Clamps withdrawn and basting threads drawn taut. Invagination good. No hemorrahge. Anastomosis made with one running Cushing suture of black silk, approximately ⅛ inch from the basting stitch. Basting stitches withdrawn.

Result.—Death on eleventh day from obstruction.

Autopsy.—Peritoneum healthy. Line of suture intact, with extreme dilatation above and collapsed bowel below. Stricture complete; turned-in ends of the sutured bowel having become adherent across the lumen of the gut and organized into a solid septum.

OBSERVATION No. 2.—End-to-end anastomosis. Twenty-pound bitch. Ether anesthesia. High median incision. Small bowel delivered. Clamps (¼ inch wide) applied transversely to the bowel axis and 5 inches of gut excised. Basting threads drawn taut. Invagination imperfect on account of projection of wide crushed area. No hemorrhage. Anastomosis made with interrupted Halsted mattress sutures of one-half the circumference and an inverted oblique Lembert suture in the other half. Basting threads withdrawn.

Result.—Death on the seventh day from obstruction.

Autopsy.—Peritoneum healthy. Line of suture intact with moderate dilatation above a complete stricture. The same condition obtained as in the previous experiment, *i. e.* a complete diaphragm had formed from the organization of the turned-in edges.

OBSERVATION No. 3.—End-to-end anastomosis. Thirteen-pound dog. Ether anesthesia. Low median incision. Small bowel delivered. Clamps applied transversely and a small portion excised. Basting stitch over clamps. Clamps removed and basting threads drawn taut with perfect invagination. Anastomosis made with one running Cushing silk suture. Basting threads withdrawn.

Result.—Death on third day from obstruction.

Autopsy.—Peritoneum healthy. No adhesions. Line of suture intact. Stricture complete with considerable dilatation above and collapsed bowel below.

In these cases too much bowel wall (about ½ inch which was greater than the radius of the gut) was turned in, and becoming adherent across the lumen, formed a diaphragm. Cases 2 and 3 were done before the result of case 1 was known. Had we realized that each step, the clamp (¼ inch wide), the basting stitch and the suture successively turned in more bowel wall, these fatalities might have been avoided. We then had made by Lenz and Lossau of Washington a strong narrow clamp with longitudinal serrations on its crushing edges and

the blades bevelled away on one side to facilitate the placing of the basting stitch close to it. We also decided to operate on larger dogs.

Observation No. 4.—End-to-end anastomosis. Large 28-pound bitch. Ether anesthesia. Low median incision. Small bowel delivered. New narrow clamps applied transversely to the axis of the gut and portion excised. Basting stitch applied over clamps. Clamps removed. Basting threads drawn taut causing good invagination. Anastomosis made with one continuous Lembert suture of silk. Basting threads withdrawn.

Result.—Good.

Subsequent operation with removal of specimen 26 days after first. Peritoneum healthy. Few adhesions to anastomosis which was excised. Line of suture intact with slight constriction, and some hypertrophy and dilatation for about 3 inches above.

Observation No. 5.—End-to-end anastomosis. Twenty-five-pound dog. Ether anesthesia. Low median incision. Narrow clamp applied transversely to small bowel and a portion excised. The actual cautery was used for one incision. Basting threads drawn taut giving good invagination. Anastomosis made with a Connell running suture of silk. Basting threads withdrawn.

Result.—Good.

Subsequent operation 19 days later with removal of specimen. Peritoneum healthy. Anastomosis intact with slight constriction, and considerable dilatation and hypertrophy above.

Observation No. 6.—End-to-end anastomosis. Same dog as in Observation No. 5. Ether anesthesia. Low median incision. The old anastomosis delivered and excised between the narrow clamps which were applied transversely to the bowel axis. Basting stitches over clamps. Clamps withdrawn. Basting threads tightened and anastomosis made with a continuous oblique suture of silk. Basting threads withdrawn.

Results.—Good.

Dog still living.

In the three previous cases where we obtained larger dogs with much difficulty the results were good, but in the two that were subsequently examined at a later operation, slight stricture with hypertrophy and dilatation above, as noted by Edmonds and Ballance, was found. This led us to adopt the oblique incision of the gut; i. e., at an angle of 45 degrees to the intestinal axis. It can be demonstrated mathematically that this gives a lumen double in area that of the incised bowel. We were interested and not a little surprised to find that on making the anastomosis after an oblique incision, absolutely no angulation was apparent but only some "bagging" of the mesenteric border. Even at later removal of these specimens, the bowel at the site of suture was apparently straight. On distension with water it assumed a slight angle of say 160 degrees and on slitting it up along the free border a funnel-shaped depression at the mesenteric side was the only evidence of the oblique incision. Again, the dilatation and hypertrophy of the bowel wall above this line as found in cases 5 and 6 was entirely done away with. It has never been noted following oblique anastomosis.

The danger of turning in too much margin due to the narrow gut of the dog and proportionate great thickness of its walls was easily overcome by this procedure. It is not necessary in the human adult intestine, but might be found useful in small children where the proportion between the size of the bowel and the thickness of its walls more nearly approaches that found in dogs.

Observation No. 7.—End-to-end anastomosis. Twenty-pound dog. 1½ gr. morphine followed by ether anesthesia. Low median incision. Small bowel delivered. Clamps applied obliquely to the gut axis and portion between them excised. Basting stitch over clamps. Clamp withdrawn. Basting threads drawn taut. Anastomosis made with running Lembert sutures of silk. Basting threads withdrawn.

Result.—Death on third day from pneumonia.

Autopsy.—Peritoneum healthy. Line of suture intact. No stricture, no dilatation. No angulation apparent. Both pleura filled with fluid. One lung consolidated. The specimen removed showed a perfectly tight joint without angulation. On section there was no evidence of a diaphragm. A slight fringe of thin tissue possibly 1/16 of an inch wide was all that was left of the turned-in portion of the bowel wall after two days. That portion crushed by the clamps and subsequently turned in (consisting of fibrous and peritoneal coats) evidently had undergone rapid atrophy.

Observation No. 8.—End-to-end anastomosis. Small 15-pound dog. Ether anesthesia. High median incision. Small bowel delivered and a portion excised between narrow clamps which were applied obliquely to the gut axis (about 45 degrees). Basting stitch over clamps. Clamps withdrawn. Basting thread drawn taut and anastomosis made with a running oblique silk suture. Basting threads withdrawn.

Result.—Good.

Subsequent operation 54 days after the excision of specimen. Peritoneum healthy. Line of suture intact with no constriction and no dilatation. No appreciable angulation was apparent but on slitting up the specimen a funnel-shaped depression was seen in the mesenteric border at the line of suture.

Observation No. 9.—End-to-end anastomosis. Fifteen-pound dog. Ether anesthesia. Incision through rectus. Small bowel delivered. Clamps applied obliquely to the axis at about an angle of 45 degrees. Basting stitches over clamps. Clamps removed. Basting stitches drawn taut and anastomosis made with running Lembert suture of silk. Basting threads withdrawn.

Result.—Good.

Dog killed 36 days after operation.

Autopsy.—No stricture, no dilatation. No angulation of gut apparent.

Observation No. 10.—End-to-end anastomosis. Seventeen-pound dog. Ether anesthesia. Incision through rectus. Small bowel delivered. Clamps applied obliquely. Portion excised. Basting stitches over clamps. Clamps removed and basting threads drawn taut. Anastomosis made with running Lembert suture of silk. Basting threads withdrawn.

Result.—Good.

Dog killed 30 days after operation.

Autopsy.—Peritoneum healthy. Line of suture intact. No dilatation. No stricture. Again no angulation was apparent and when the gut was distended with water an angle of only 160 degrees or less was found.

Observation No. 11.—End-to-end anastomosis. Fifteen-pound dog. Ether anesthesia. Incision through rectus. Small bowel delivered. One clamp applied obliquely and one transversely. Portion of gut excised. Basting stitches over clamps. Clamps removed. Basting threads drawn taut. Oblique incision had to be gathered on its basting thread to conform to transverse incision. Anastomosis made with running Lembert suture of silk. Basting threads withdrawn.

Result.—Death from obstruction 10 days after operation. Peritoneum healthy. Line of suture intact. Stricture absolute

FIG. 1.—Two clamps have been placed across the intestine preparatory to division of its walls. The portion to the observer's left is the portion to be resected. Observe the oblique angle.

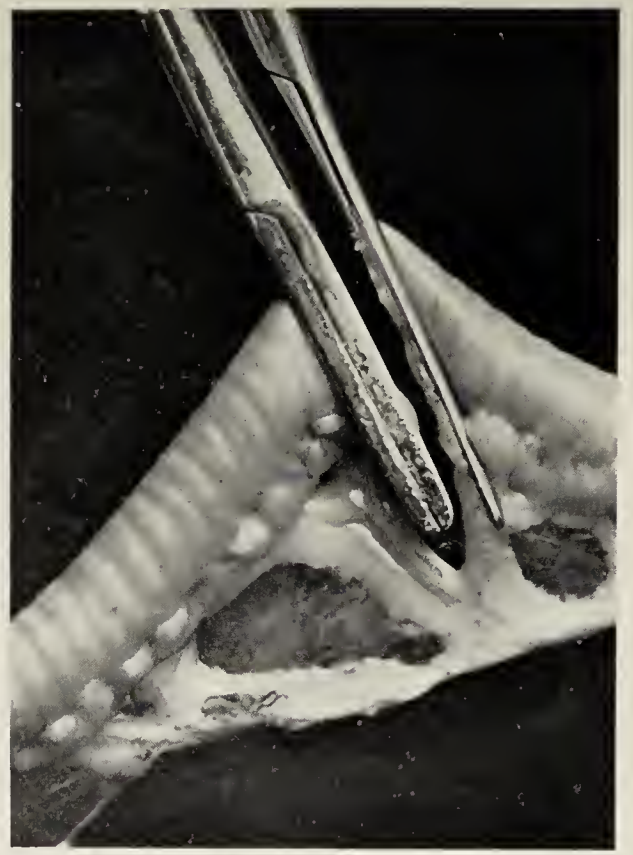

FIG. 2.—Intestinal walls have been divided. The clamp at the observer's left is upon the end which is to be sutured.

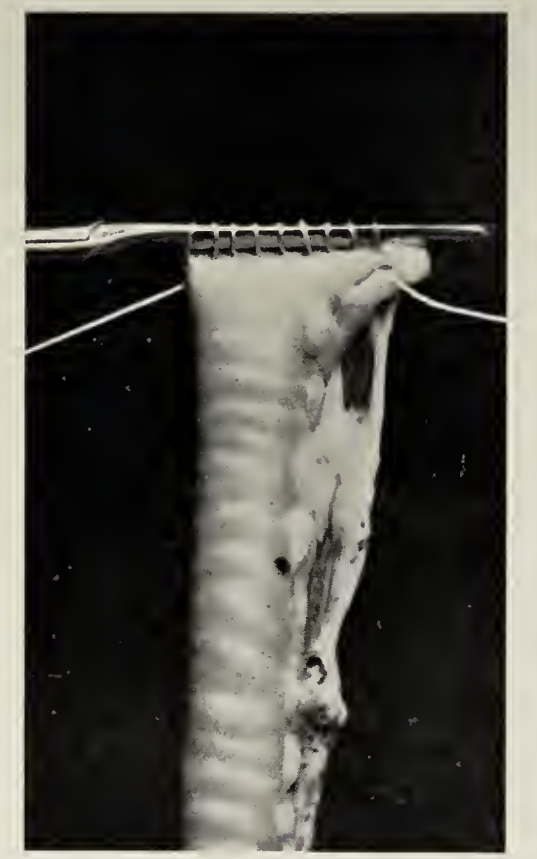

FIG. 3.—The basting stitch has been placed in position upon the clamped incision.

FIG. 4.—The clamp has been withdrawn from under the loops of the stitch. The narrow ridge of crushed tissue is seen showing the marks made by the longitudinal serrations of the clamp. At the observer's left the incision is beginning to gap open slightly during the time necessary to adjust the specimen for the photograph.

FIG. 5.—The basting stitch is in the act of being drawn taut, three loops still showing in the center.

FIG. 6.—The two basting stitches have been drawn taut and the intestinal ends are held in position by the basting threads. The suture has been begun upon the intestinal walls which lie in contact.

FIG. 7.—The suture has been continued around the mesenteric angle and across the two anterior walls nearly to the point of starting.

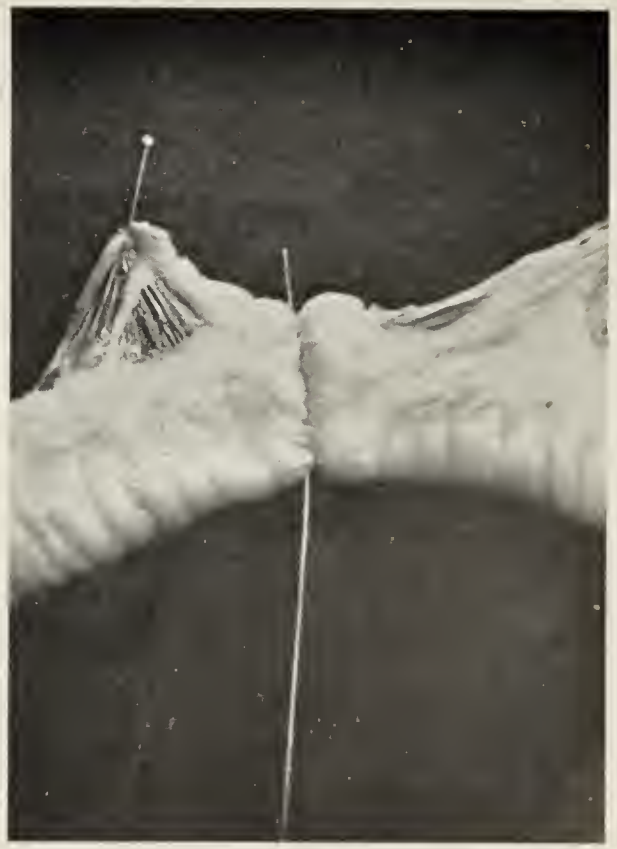

FIG. 8.—The suture is complete. The basting threads have been cut short. One of them has been withdrawn. With the withdrawal of the other the lumen will become open.

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with extreme dilatation above and collapsed bowel below. The lateral wall of the gut on either side of the suture line had become adherent for about 3 inches and caused an acute kink at that point.

OBSERVATION No. 12.—Lateral anastomosis. Sixteen-pound dog. Ether anesthesia. High median incision. Small bowel containing old anastomosis (Observation No. 7) delivered. Clamps applied transversely and specimen of previous operation excised. Basting stitches over clamps. Clamps removed. Basting threads drawn taut. Basting thread was then utilized to complete the closures of the blind ends as a running Lembert stitch along the invaginated end.

At the free border of the gut near each closed end, three needles were plunged in to the lumen of the bowel and brought out again about ¼ inch from the point of entrance. They were placed parallel, about ½ inch apart and at right angles to the bowel axis and plane of the mesentery. The clamps were then placed beneath these needles so as to grasp in their bite the bowel wall between the points of entrance and exit of the needles. This maneuver insured the grasping of mucous membrane in the clamp and a complete severance of all walls of the intestine when the strip of tissue above the clamp and containing the needles was cut away. The basting stitch was applied as in end-to-end suture over the clamps which were then removed and the basting threads drawn taut. Suture completed with continuous running Lembert suture and the basting threads withdrawn.

Result.—Good.

Subsequent operation 100 days later revealed healthy peritoneum. Line of suture intact with no dilatation and no stricture.

OBSERVATION No. 13.—End-to-end anastomosis. Sixteen-pound dog. Ether anesthesia. High incision through rectus. Small bowel containing specimen of previous operation (Observation No. 11) delivered, and specimen excised between clamps transversely to the bowel axis. Basting stitches over clamps. Clamps removed. Basting threads drawn taut. Ends of one basting thread (*i. e.* on the distal end) tied tight together, thus puckering up the invaginated bowel wall and effectually closing the blind end. No other suture used for this closure. About 1 inch from the closed end a clamp applied along the free border of the gut parallel to the axis and under two needles thrust into the lumen. Tissue in bite of clamp cut off with the knife close to clamp and basting stitch inserted. Clamps removed. Second basting thread drawn taut. It was then found that this longitudinal incision doubled that in the proximal end but by puckering or gathering the tissue on its basting thread the length of the two incisions was made equal and the difficulty easily overcome. Anastomosis made as usual with a running oblique Lembert suture. Basting threads withdrawn.

Result.—Good.

Dog killed 40 days after operation. Peritoneum healthy. Line of suture intact. No dilatation and no stricture.

OBSERVATION No. 14.—Posterior gastro-enterostomy. Nineteen-pound dog. Ether anesthesia. High median incision. Stomach and jejunum delivered. Clamps applied longitudinally under needles previously plunged into the lumen of both viscera to insure grasping of mucous membrane. Basting stitch of old silk that had been repeatedly sterilized applied over clamps. Clamps removed. One basting thread on being tightened broke in the tissues and had to be teased out. This necessitated exposing the lumen of the gut. Suture completed with a running Lembert stitch.

Result.—Good.

Dog killed 40 days after operation. Peritoneum healthy. Line of suture intact. No stricture.

OBSERVATION No. 15.—Posterior gastro-enterostomy. Seventeen-pound dog. Ether anesthesia. High median incision. Stomach and jejenum delivered. Clamps applied parallel to the long axis of each viscus and under needles previously plunged into the lumen. Strip of tissue containing needles cut away close to the clamps. Basting stitches applied as usual. Clamps removed. Basting threads drawn taut and anastomosis made with a continuous running Lembert suture of silk.

Result.—Good.

Dog killed 69 days after operation. Peritoneum healthy. Line of suture intact. No stricture.

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A CLINICAL STUDY OF THE ALKALINITY OF THE BLOOD.

By SOLOMON STROUSE, M. D.,

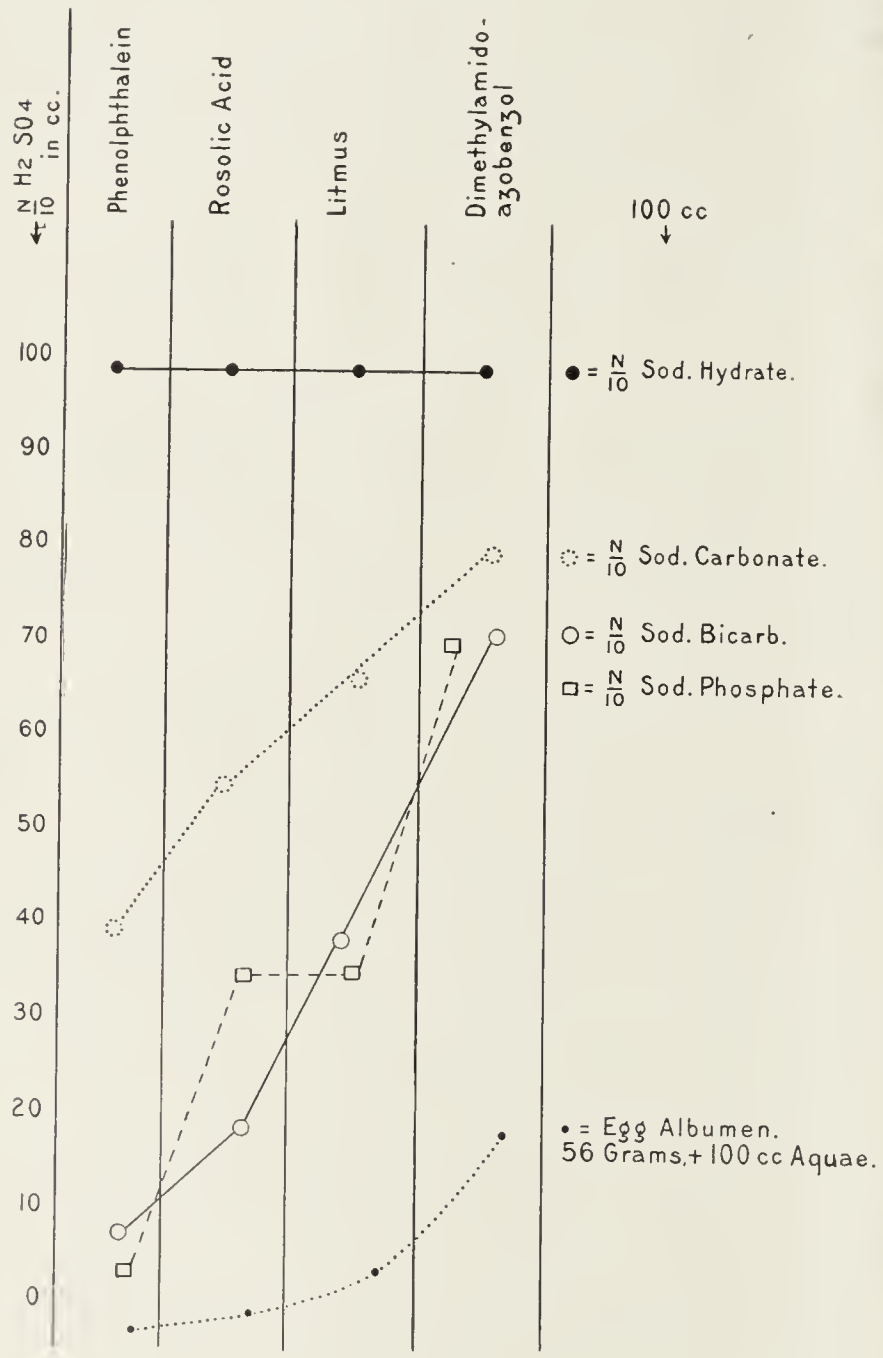
(From the Clinical Laboratory, The Johns Hopkins Hospital.)

This work was undertaken at the suggestion of Dr. Thomas R. Boggs in order to determine, as far as possible, the value of clinical methods of measuring the alkalinity of the blood. So many methods have been proposed that trials of each have been impossible; and our work has been confined to some of the more promising and least tried ones. From actual studies, as well as a review of the literature, the conclusions which form the basis of this report have been formulated.

The blood is not an alkaline fluid in the sense that a solution of sodium hydrate is alkaline. It is a very complex mix-

ture of salts, mainly carbonates and phosphates, with other substances such as proteins which may combine with either alkalies or acids. Probably its most important constituents from the standpoint of alkalinity are sodium bicarbonate and sodium phosphate, which are really acid salts with an alkaline reaction to most indicators. As a matter of fact, all recent studies in physical chemistry have proved the practical neutrality of the blood, while Friedenthal by most interesting biological deductions has arrived at the same conclusion. It can

CHART I.



also be shown by simple titrations that the alkaline reaction of blood is not like that of a solution of sodium hydrate. Blood serum will give varying figures of alkalinity depending on the indicator used; to phenolthalein it is practically neutral, to litmus its alkalinity is represented by about 50 mg. of sodium hydrate per 100 cc. serum, to dimethylamidoazobenzol by approximately 300 mg. Now as shown in Chart I 100 cc. of a solution of $\frac{N}{10}$ sodium hydrate will be neutralized by practically 100 cc. $\frac{N}{10}$ sulphuric acid, no matter what indicator is used: but the amount of $\frac{N}{10}$ sulphuric acid required to neutralize 100 cc. $\frac{N}{10}$ sodium carbonate, sodium bicarbonate, or di-sodium phosphate varies tremendously, depending on the indicator, the reaction of the three latter salts being analogous to that of the blood.

Moreover it must be borne in mind that blood is a combination of materials in suspension and in solution, and that only a portion of the total alkalinity can be neutralized by the addition of acid: this the Germans call "titrirbare alkali" (neutralizable alkali) and is the same as "reactivity" as defined by Moore and Wilson. This neutralizable alkali has been the basis of most of the methods in use, but how far it does represent the true chemical *status* of the blood is not certain.

The relation of the serum to the whole blood is of great importance. It is known that the neutralizable alkali of the total blood is considerably greater than that of the serum, but as I have elsewhere shown, the relation is constant enough to allow of the use of serum for comparative clinical studies.

Clinical methods are not necessarily as accurate as laboratory methods; at best such methods are often a "compromise between accuracy and simplicity." They must be measured by the results obtained; if they are only of comparative value and yet of service clinically, they can be considered useful. In the effort to obtain accurate clinical methods in the study of the chemistry of the blood numerous difficulties are encountered, as is made evident by the great number of methods proposed and the results so far obtained. I have notes of about 35 methods; yet despite this we are hardly any further advanced toward an accurate method of measuring the alkalinity of the blood than we were in 1850 when Cahen *fils* proposed the first quantitative estimation.

The methods can be divided into three general classes:

(1) Titration.

(2) Carbon-dioxide estimation.

(3) Physical-chemical.

Physical chemistry has not yet given any methods suitable for clinical adaptation. Since Zuntz, in 1867, first attempted to measure the alkalinity of the blood by determination of the carbon-dioxide content there have been several further efforts to perfect such a method.

The results have been discordant, and furthermore as all carbon-dioxide determinations are based on gas analyses, they can not readily be adapted to clinical purposes. The discussion of clinical methods then is limited to titration. The inherent difficulties in titration are evident. The dual character of the blood, suspension and solution, the deep red color which interferes so greatly with the use of indicators, are obstacles in the way of accurate titration. The results obtained will depend to a great extent on the nature of the acid and indicator employed. Further some difference in results will be observed, depending on whether we titrate to neutrality as in the Loewy-Engel method, or whether we add an excess of acid and then titrate the uncombined acid with alkali. In the first case we measure simply the neutralizable alkali, in the second we are dealing with a more complex question owing to the presence of proteins, urea and other bodies which may take up the

excess of acid and yet not influence the indicator. An analogous reaction is seen when a mixture containing egg albumen, sodium carbonate, sodium bicarbonate, and sodium phosphate is studied, for such a mixture will give higher values of alkalinity when titrated with sulphuric acid to excess than when titrated to neutrality. This means that the total basicity and the neutralizable alkali of the blood are not the same. The Shultz-Shultzenstein method will probably measure the total basicity, while the Loewy-Engel will only give the equivalent of the neutralizable alkali.

The Engel method is as follows: 0.05 cc. blood is drawn into a special pipette, diluted with water and mixed. It is then blown into a small beaker and titrated with $\frac{N}{75}$ tartaric acid, which is dropped from a special burette. After each drop is added and stirred, it is tested on lacmoid paper. The end reaction is determined when the drop on the paper has a sharp red edge. The average normal blood requires about ten drops. As a known amount of blood is used, it is easy to calculate how much acid is required to neutralize 100 cc. of blood, and from this the sodium hydrate equivalent is expressed.

To obviate the physical difficulties of titration with whole blood, several investigators have used serum. As shown in a previous paper, while serum represents only a portion of the total neutralizable alkali, it does represent a fairly constant percentage of the total; and furthermore the use of serum allows of much greater technical simplicity than is possible with the whole blood. For this reason and because serum titration has not been tried as much as other methods, all our actual studies have been confined to serum. The method and the results obtained will be discussed later.

Until recent times when physical chemistry showed us that the blood is practically neutral, the results obtained by clinical methods of hæmalkalimetry have been as variously interpreted as the methods were numerous. From the mass of conflicting testimony little of real value has been given to medicine; according to some authors certain diseases were associated with reduced alkalinity, while other men found exactly opposite results in the same disease. The only disease in which unanimity existed was in diabetes in the stage of coma; although even here, Benedict by "electro-motor" methods, could not find a constant change. Digestion has been supposed to be associated with an increase in the alkalinity due to the secretion of HCl in the stomach, but this has been denied by as careful a worker as H. Straus of Berlin. The values for normal have varied from 182 mg. of NaOH per 100 cc. (Landois) blood to 533 (Engel), as seen in this table:

Landois,	182	to	218	mg.	NaOH	per	100	cc. blood.
Lepine,	203	"	276	"	"	"	"	" "
Berend,	450	"	500	"	"	"	"	" "
Strauss,	300	"	350	"	"	"	"	" "
Engel,	426	"	533	"	"	"	"	" "
Loewy,	407	"	508	"	"	"	"	" "
Orlowski,	240	"	267	(Litmus)	"	"	"	" "
	267	"	289	(Lacmoid)				
Salkowski,	368	"	400	males	"	"	"	" "
	302	"	314	females				

These averages have been obtained by the different investigators using different methods. Orlowski used the Engel method.

The figures in pathological conditions vary tremendously. Burmin found a decrease in 62 patients suffering from all sorts of diseases. Jaksch and Kraus note a decrease in febrile diseases in general: Loewy, Strauss, and Kireef believe that there is an increase or an inconstant change without rule. Karfunkel disagrees with the general opinion that in pneumonia the alkalinity is low; Kireef claims it to be high in typhoid, whereas others (Waldvogel) find it raised at the beginning of the disease, low towards the end. In this connection, it is of interest to mention certain experimental studies with relation to immunity. Fodor showed that the blood of animals given NaOH or KOH by mouth was bactericidal *in vitro*. Behring thought that the high alkalinity of the blood of white rats was the cause of their immunity to anthrax. Fodor believed that animals first react to infection by a rise in the alkalinity, followed by a fall; if the infection is conquered there is a second rise, but if unconquered, the alkalinity remains low. Calabrese considers the alkalinity of the bloods the means of guarding against the action of toxins.

The reported variation in the alkalinity in chronic diseases is smaller, possibly because of the cachexia which is fairly constantly present. The studies on cancer are most interesting. Karfunkel, Moore and Wilson disagree with the general opinion that in cancer the alkalinity of the blood is low; Moore and Wilson, correlating their results with work done in their laboratory proving that there is a decrease in the acidity of the gastric juice in cancer anywhere in the body, consider high alkalinity of the blood a possible etiological factor in cancer. In nephritis, cirrhosis of the liver, the last stages of pulmonary tuberculosis a reduced alkalinity is claimed, although it must be added that one or more investigators can be found to disagree with the conclusion in almost every case. In diabetes mellitus except in coma, Straus, Magnus-Levy, and Loewy found the alkalinity increased, whereas most investigators find it decreased. Practically all, except Benedict, find a decreased alkalinity in diabetic coma.

Our measurements have been confined to the serum. Our results obtained with the Wright method were published in a late number of this journal. Following the suggestion of Lumière, Lumière and Barbier, who claim to have investigated 500 indicators, and the more recent work of Adler, we made numerous tests with rosolic acid as an indicator; but we found the blood serum so nearly neutral to it and the end reaction so difficult to determine that titration was extremely unsatisfactory. The Dare apparatus has also been tried, but the delay in the end reaction and the consequent uncertainty of the exact point of neutralization offer serious objections to the use of this ingenious method. Moore and Wilson described a series of methods which they used with apparently excellent results. In all three they used the Wright capillary pipette: (1) titrating the serum with sulphuric acid, using a 1 per cent solution of dimethylamidoazobenzol as indicator; (2) titrating with sodium hydrate, using phenolphthalein as

indicator; (3) incineration, and titration of the ash as in method (1). We have employed with a few technical modifications the first two methods, but have not used the ash determination. With phenolphthalein to which blood is neutral or slightly acid, we were unable to obtain any results of value, agreeing in this respect with the authors. The work with dimethylamidoazobenzol gave results of interest.

Whereas with litmus paper the neutralizable alkali is equivalent to $\frac{N}{35}$ sulphuric acid, with dimethylamidoazobenzol it is $\frac{N}{6}$ to $\frac{N}{7}$. Therefore sulphuric acid is prepared in solutions from $\frac{N}{3}$ to $\frac{N}{10}$ in a series differing by half a dilution, so that we have ready $\frac{N}{3}$, $\frac{N}{3.5}$, $\frac{N}{4}$, $\frac{N}{4.5}$, etc. to $\frac{N}{10}$ acid. The indicator is a 1 per cent solution of dimethylamidoazobenzol in absolute alcohol. Blood is obtained in thoroughly cleansed capsules, allowed to clot, and the serum used 3 to 4 hours afterwards.

In all our work, blood has been obtained between 11 a. m. and 12 m. and readings made between 2 and 4 p. m. Moore and Wilson advise adding 8 drops of the indicator to each 100 cc. of acid, but we found it more accurate to add 1 drop to each cc. One cc. of each solution of acid with 1 drop of indicator is poured in watch glasses or the water-color palette, then by means of the capillary pipette equal amounts of blood serum and of say $\frac{N}{10}$ acid are drawn and mixed, then of serum and $\frac{N}{9}$, and so on with stronger acids until a slight tinge of red is seen in the mixture. The acid first giving this tinge is considered to measure the alkalinity. We found that the end reaction could be better appreciated if the titration began with the weaker acids and progressed towards the stronger, so that this procedure was constantly practiced instead of the reverse as done by Moore and Wilson. All the capillary pipettes had approximately the same bore: we kept a few in stock which were cleaned and used repeatedly, so that the volume of serum was practically the same in all experiments. The technic while simple in outline, is somewhat difficult in practice, and slight variations from an absolute standard caused noticeably different results; yet after a constant technic was acquired we found the end reaction fairly easy to determine. In almost every case we could note a sharp change of color from yellow to reddish when the mixture of serum, acid, and indicator became acid, and this change could be appreciated when the acids used varied by one-half a dilution. For instance, if a mixture of serum, indicator, and say $\frac{N}{7.5}$ acid was still yellow, the next mixture of serum and $\frac{N}{7}$ acid would still be yellow, or would show a decided reddish tint. In a few cases, however, these changes were not so sharp. Therefore our actual results with the pipette method answer the *a priori* objections advanced in our preliminary report.[1]

[1] See the Bulletin of the Johns Hopkins Hospital, Nos. 195-196, June-July, 1907, p. 221.

The slight modifications in technic employed by us are probably sufficient to account for the difference in normal values obtained: Moore and Wilson's being $\frac{N}{5.5}$ to $\frac{N}{6}$: ours being $\frac{N}{6.5}$ to $\frac{N}{7}$. A better way to express our results would be in terms of sodium hydrate per 100 cc. of serum as is done in the Engel and in most other methods. This is simply accomplished. When we find that the alkalinity of the serum is $\frac{N}{7}$ sulphuric acid, we mean that a certain small portion of serum is neutralized by the same amount of $\frac{N}{7}$ acid. Presumably then 100 cc. of serum would be neutralized by 100 cc. $\frac{N}{7}$ acid, which is equivalent to 100 cc. NaOH. Therefore, to express the figure of alkalinity in terms of sodium hydrate all that is necessary is to give the actual amount of sodium hydrate in the specific normal solution, according to the following table:

N/5	Sulphuric Acid	is	equivalent	to	400	mg.	NaOH	per	100	cc.	serum.
N/5.5	"	"	"	"	363	"	"	"	"	"	"
N/6	"	"	"	"	333	"	"	"	"	"	"
N/6.5	"	"	"	"	307	"	"	"	"	"	"
N/7	"	"	"	"	285	"	"	"	"	"	"
N/7.5	"	"	"	"	266	"	"	"	"	"	"
N/8	"	"	"	"	250	"	"	"	"	"	"
N/8.5	"	"	"	"	235	"	"	"	"	"	"
N/9	"	"	"	"	222	"	"	"	"	"	"
N/9.5	"	"	"	"	210	"	"	"	"	"	"
N/10	"	"	"	"	200	"	"	"	"	"	"

Karfunkel, Lumière, Lumière and Barbier, have proved that the alkalinity does not increase proportionately to the amount of blood used. Thus these percentages would all be too high. Nevertheless they can be used for comparison with each other. Furthermore as almost all other clinical methods give figures based on similar calculations, they can also be used to compare with the results of other investigators.

The charts of results show that the neutralizable alkali of the blood serum as indicated by dimethylamidoazobenzol varies in different cases, that the variation is as a rule slight, and that it usually indicates a diminution. It is further apparent that in no disease is there a constant diminution, nor does the change seem to bear any very definite relation to the clinical picture. Studying the series of typhoid fever or pneumonia cases we see in some patients with signs of extreme intoxication normal alkalinity, whereas in others apparently less ill we have readings below normal. From these results it seems fair to draw one conclusion: Whatever these changes in the neutralizable alkali may mean, they are not specific for the underlying disease. When changes do occur they indicate a disturbance in the individual, most probably due to altered oxidation. This may depend on any one of a group of factors such as nutrition, the effect of fever on the concentration of the blood, or, what is most probable on some chemical change the nature of which is unknown to us. The changes in the neutralizable alkali may be compared to the urinary output, which varies in each case and depends in part on factors other than the disease itself. Gautrelet, basing his conclusions on biological studies, thinks that a direct relation exists between the alkalinity of the blood and "respiratory exchanges." The practice of averaging results in any disease for comparison

CHART 2.—NORMAL.

Case No.	Sex.	Color.	Age.	Date.	NaOH. Mg.	Remarks.
1.....	M.	W.	25	V, 6, 1907	307	
2.....	M.	W.	25	V, 20, 1907	285	
3.....	M.	W.	25	V, 24, 1907	307	
4.....	M.	W.	25	X, 19, 1907	285	
5.....	M.	W.	25	X, 24, 1907	285	
6.....	M.	W.	25	X, 25, 1907	285	
7.....	M.	W.	28	V, 10, 1907	285	
8.....	M.	W.	27	V, 19, 1907	285	
9.....	M.	W.	28	X, 18, 1907	285	
10.....	M.	W.	26	X, 18, 1907	266	One week before typhoid fever.
11.....	M.	W.	26	I, 15, 1908	307	After typhoid.
12.....	M.	W.	24	X, 19, 1907	307	
13.....	M.	W.	30	XI, 25, 1907	307	
14.....	M.	W.	32	I, 13, 1908	285	
15.....	M.	W.	34	I, 13, 1908	307	
16.....	M.	W.	24	I, 15, 1908	285	
17.....	M.	W.	26	I, 15, 1908	285	
18.....	M.	W.	24	I, 16, 1908	307	

These readings were made on healthy doctors, students and laboratory workers. They are all 285–307 mg. NaOH per 100 cc. serum except case 11. This man one week later developed a mild case of typhoid fever, and the low reading may have been due to the infection.

CHART 3.—TYPHOID FEVER.

Case No.	Sex.	Color.	Age.	Date.	NaOH. Mg.	Remarks.
1.....	M.	W.	26	V, 25, 1907	250	17th day. Soft diet. Temp. 101°.
2.....	M.	B.	24	X, 19, 1907	266	Paratyphoid; 63rd day. Soft diet. Temp. normal.
3.....	M.	W.	13	X, 25, 1907	235	43d day. Soft diet. Temp. 101°. }
4.....	M.	W.	13	XI, 29, 1907	285	78th day. Soft diet. Temp. 99°. } Same case.
5.....	M.	W.	13	XII, 18, 1907	333	98th day. Soft diet. Temp. 98.4°. }
6.....	M.	W.	23	XI, 25, 1907	307	19th day. Milk and albumen. Temp. 104°. }
7.....	M.	W.	23	XII, 9, 1907	250	30th day. Soft diet. Temp. 103°. } Same case.
8.....	M.	W.	23	I, 14, 1908	307	70th day. Soft diet. Temp. 98.4°. }
9.....	M.	B.	26	XI, 25, 1907	307	17th day. Soft diet. Temp. 101.5°.
10.....	M.	B.	19	XI, 27, 1907	307	20th day. Soft diet. Temp. 104°. Muscle twitchings. Very toxic.
11.....	M.	W.	25	X, 24, 1907	266	12th day. Milk & albumen. Temp. 103.5°. Extreme intoxication.
12.....	M.	W.	15	I, 15, 1908	266	43d day. Recrudescence. Temp. 102°. Soft diet.

These patients were all under observations in the wards. It is seen that there are no constant changes, and no close relation between changes in alkalinity and the clinical picture.

CHART 4.—PNEUMONIA.

Case No.	Sex.	Color.	Age.	Date.	NaOH. Mg.	Remarks.
1.....	M.	W.	42	V, 7, 1907	285	Secondary. Pulmonary embolism. Temp. 100°. Death.
2.....	M.	B.	18	V, 27, 1907	250	5th day. Very toxic. Temp. 104°. Recovery.
3.....	M.	W.	18	XI, 25, 1907	307	5th day. Temp. 102°. Recovery.
4.....	M.	B.	34	XI, 25, 1907	266	9th day. Temp. 98.6°. Recovery.
5.....	M.	W.	9	XII, 18, 1907	285	2d day. Temp. 103°. Recovery.
6.....	M.	W.	19	I, 2, 1908	307	3d day. Temp. 103.5°. Recovery.
7.....	M.	W.	30	I, 7, 1908	266	14th day. (?) Temp. 102°. Recovery.
8.....	M.	W.	66	I, 2, 1908	235	8th day. Temp. 101°. Chronic nephritis. Hb = 75%. Death.
9.....	M.	W.	60	I, 14, 1908	266	2d day. Temp. 102°. Terminal cardiac. Death.
10.....	M.	B.	26	I, 13, 1908	250	9th day. Temp. 103°. Death.
11.....	M.	C.	32	I, 13, 1908	266	16th day. Temp. 100°. } Same Case. Recovery.
	M.	C.	32	I, 16, 1908	285	19th day. Temp. 98.6°. }
12.....	M.	W.	16	I, 15, 1908	250	8th day. (?) Temp. 104°. Recovery.
13.....	M.	B.	24	I, 25, 1908	266	10th day. Temp. 102°. Death.

In this series the same inconstant variations are noted as in the typhoid fever patients.

CHART 5.—NEURASTHENIA.

Case No.	Sex.	Color.	Age.	Date.	NaOH. Mg.	Remarks.
1.....	M.	W.	32	V, 7, 1907	307	With hyperchlorhydria.
2.....	M.	W.	35	V, 8, 1907	307	
3.....	M.	W.	60	V, 25, 1907	307	With hypochlorhydria.
4.....	M.	W.	40	V, 25, 1907	307	Secondary to hyperthyreoidism.
5.....	M.	W.	41	XI, 29, 1907	307	
6.....	M.	W.	21	XII, 18, 1907	307	Hyperemesis. Gastric neurosis. Acetone in breath.

All the neurasthenics showed the high limit of normal. It is interesting that there is no difference in the readings in cases 1 and 3, one with hyperacidity of the gastric juice, one with subacidity. Case 4 was a mild latent case of hyperthyreoidism.

CHART 6.—DIABETES MELLITUS.

Case No.	Sex.	Color.	Age.	Date.	NaOH. Mg.	Remarks.
1.....	M.	W.	39	V, 26, 1907	235	Reading donbtful. Acetonuria.
2.....	F.	W.	60	V, 26, 1907	250	Acetonuria.
3.....	F.	B.	47	V, 10, 1907	266	No acetonuria. Also Cardio-renal.
	F.	B.	47	V, 27, 1907	266	" " " "
4.....	M.	W.	(?)	X, 25, 1907	307	Coma. Day before death.
5.....	F.	W.	42	I, 7, 1908	307	Acetonuria.

All these patients were receiving sodium-bicarbonate. The variations are certainly not constant. Case 4 is especially interesting in view of Benedict's results in diabetic coma.

CHART 7.—CHRONIC NEPHRITIS.

Case No.	Sex.	Color.	Age.	Date.	NaOH. Mg.	Remarks.
1.....	M.	W.	45	V, 6, 1907	266	Cardio-renal. Uræmia. Acetonuria.
2.....	F.	B.	47	V, 10, 1907	266	Also diabetes. Cardio-renal. Same case.
	F.	B.	47	V, 27, 1907	266	No acetonuria. No uræmia. Same case.
3.....	F.	W.	18	V, 20, 1907	285	Headache, nausea, vomiting.
4.....	F.	W.	20	XI, 27, 1907	285	Uræmic symptoms. Hb=55 %.
5.....	M.	B.	33	XI, 27, 1907	307	No uræmic symptoms.
6.....	F.	W.	22	XII, 3, 1907	285	Uræmic.
7.....	M.	W.	42	XII, 10, 1907	250	Cardio-renal; no uræmic symptoms.
	M.	W.	42	XII, 30, 1907	250	Same case, day before death.
8.....	M.	W.	42	XII, 10, 1907	266	Headache, blood-pressure 230; Hb=90 %.
9.....	M.	W.	58	XII, 10, 1907	307	Headache, dyspnœa, Hb=65 %.
10.....	M.	W.	59	XII, 10, 1907	266	Headache, drowsiness, dyspnœa, Hb=90 %.
11.....	M.	W.	22	XII, 30, 1907	285	Cardio-renal, day before death. Hæmoglobinæmia.
12.....	M.	W.	30	XII, 10, 1907	250	Also acute bronchitis. Temp. 99°. Hb=56 %.
13.....	M.	W.	66	I, 2, 1908	235	Also pneumonia, 8th day. Temp. 101°. Hb=75 %.

CHART 8.—MALIGNANT DISEASE.

Case No.	Sex.	Color.	Age.	Date.	NaOH. Mg.	Remarks.
1.....	M.	W.	49	I, 16, 1908	285	Epithelioma. Eyelid. Hb=75 %.
2.....	M.	W.	42	I, 16, 1908	307	Carcinoma, submaxillary.
3.....	F.	W.	52	V, 20, 1907	250	Carcinoma, stomach. Hb=72 %.
4.....	M.	W.	32	I, 16, 1908	285	Sarcoma, retroperitoneal. Hb=70 %.
5.....	M.	W.	23	X, 24, 1907	266	Sarcoma, testicle; retroperitoneal metastasis. Hb=60 %.

CHART 9.—CHRONIC DISEASES, WITH ANÆMIA.

Case No.	Sex.	Color.	Age.	Date.	NaOH. Mg.	Remarks.
1.....	M.	B.	66	X, 19, 1907	235	Cirrhosis of liver, luetic (?) No cholæmia.
	M.	B.	66	XI, 27, 1907	250	Hb=60 %.
	M.	B.	66	XII, 3, 1907	250	
2.....	M.	W.	53	XII, 18, 1907	266	Splenomegaly. Scleræ jaundiced. Hb=68 %.
3.....	M.	W.	44	V, 10, 1907	266	Pernicious anæmia (primary) Hb=48 %.
4.....	F.	W.	36	V, 20, 1907	235	Cholelithiasis. Cholæmia. Hb=15 %.
5...	M.	W.	26	X, 24, 1907	250	Double tertian malaria. Hb=32 %.
6.....	M.	W.	20	XI, 29, 1907	285	Amœbic dysentery. Tonsillectomy. Hb=56 %.
7.....	M.	W.	51	V, 30, 1907	250	Scurvy. Subcutaneous hæmatomata.
	M.	W.	51	V, 31, 1907	250	Hb=45 %.

In charts 7, 8, 9 it is seen that the effect of the blood count on the neutralizable alkali of the serum is by no means constant.

CHART 10.—MISCELLANEOUS.

Case No.	Sex.	Color.	Age.	Date.	NaOH. Mg.	Remarks.
61.....	M.	W.	39	XI, 29, 1907	307	Myocarditis.
62.....	M.	W.	45	I, 2, 1908	307	Delirium Tremens. Acute bronchitis. Temp. 101.5°.
55.....	M.	W.	10	V, 6, 1907	307	Pulmonary tuberculosis.
55.....	M.	W.	10	V, 7, 1907	307	
56.....	M.	W.	6	V, 8, 1907	250	Pulmonary abscess. Death.
56.....	M.	W.	6	V, 25, 1907	235	
57.....	M.	B.	31	V, 27, 1907	266	Tuberculous pleurisy and peritonitis.
58.....	M.	W.	48	V, 19, 1907	266	Pulmonary tuberculosis. Acetone in breath.
59.....	F.	W.	15	XII, 3, 1907	285	Acute arthritis. Temp. 102.5°.
59.....	F.	W.	15	I, 14, 1908	307	Same case. Temp. 98.4°.
76.....	M.	W.	11	I, 14, 1908	266	Acute arthritis.
77.....	M.	W.	15	I, 14, 1908	266	Ulcerative endocarditis. Temp. 100°.
78.....	F.	B.	32	I, 13, 1908	250	Endocarditis, purpura. Hb=70 %. Day of death.
60.....	M.	W.	24	XI, 29, 1907	266	Polycythæmia. R.B.C. 6,700,000. Hb=95 %.
43.....	M.	B.	38	XI, 27, 1907	307	Erysipelas. Abscess of axilla. Temp. 104°.

with normal does not perhaps give a just picture of the variations which may be presented in a detailed study of the individual; still it is patent from our observations that although the individual variations may be greater than is indicated in general averages, yet these so far have not shown any positive correlation to the clinical picture.

In explaining the great discordance in results of hæmalkalimetrical studies in the literature, the inherent physical and chemical difficulties, and the variations in technic must be considered of the greatest importance, but they *per se* can hardly be the only causes. The study of the original contributions, of which Drouin's thesis is an example, impresses one with two facts: first, in many instances only a few cases have been studied, and second, little or no information is given regarding the condition of the patient, his nutrition, his blood, stage of disease, etc. In other words, the deductions as to alkalinity changes in disease have been based on cases insufficient in number, and in which too little attention is paid to other conditions probably more important than the underlying disease. If, as we think, changes in the alkalinity are not specific for a disease then the name of the disease is of less importance than the general condition of the patient, and any factors which may tend to disturb the metabolism should be carefully studied. Bearing this point of view in mind we can easily conceive how a series of a few cases of typhoid fever for instance, which may happen to show reduced alkalinity at the time the blood was studied, might lead an investigator to conclude that in typhoid the alkalinity is reduced, whereas if he had studied a larger series he might have found certain cases reduced, and others normal as in our series.

Summary.

Remembering the limitations of clinical methods we should be satisfied if the results of any such method of hæmalkalimetry had aided the internist in diagnosis, prognosis, or therapy; but so far all methods have been devoid of even empirical value. Further until the time comes when we have a definite knowledge of the causes underlying relatively slight variations in the neutralizable alkali we can hope for little of practical interest from these observations.

In conclusion I wish to express my thanks to Dr. L. F. Barker for the privilege of studying the cases in the wards of the Johns Hopkins Hospital, to Dr. Carl Voegtlin for many helpful suggestions, and to Dr. Thomas R. Boggs, under whose direction this work was begun and whose assistance and encouragement alone made its completion possible.

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CARDIOHEPATIC ANGLE.

By W. J. Calvert, M. D.,
University of Missouri, Columbia, Missouri.

In 1878, Rotch (1) showed that in the early stages of pericardial effusions the fluid collected in the lower portion of the sac, especially at the right border of the sternum. Dulness in the fifth interspace at the right border of the sternum was mentioned as the first sign of pericardial effusion.

Based on Rotch's observations, and his own series of clinical cases, Ebstein (2), in 1892, came to the same conclusion as Rotch; and designated the angle formed by the right border of heart dulness and the upper border of liver dulness the "cardiohepatic angle." Normally, this angle is a right-angle; but, obtuse in pericarditis, due to displacement of the lung to the right. It is generally conceded that enlargements of the heart rarely displace the anterior border of the lung sufficiently to give an appreciable area of absolute dulness at the right border of the sternum, *B* in Fig. 1, and almost never in the fifth interspace. Absolute dulness one centimetre wide at

the right border of the sternum is perhaps the maximum, except in mitral stenosis in which the texts say that dulness may be five centimetres to the right of the right border of the sternum. The absence of this area of dulness in enlargement of the heart and its presence in pericarditis was especially emphasized by Ebstein, and later by others.

The anterior projections of two cases of pericarditis, shown in Fig. 1, show the increase in the cardiohepatic angle which may be explained as follows:

When the pericardium is distended the entire right wall, from its attachments to the large vessels above to the diaphragm below, is displaced outward; and the diaphragm with its attachment to the right wall of the pericardium is displaced

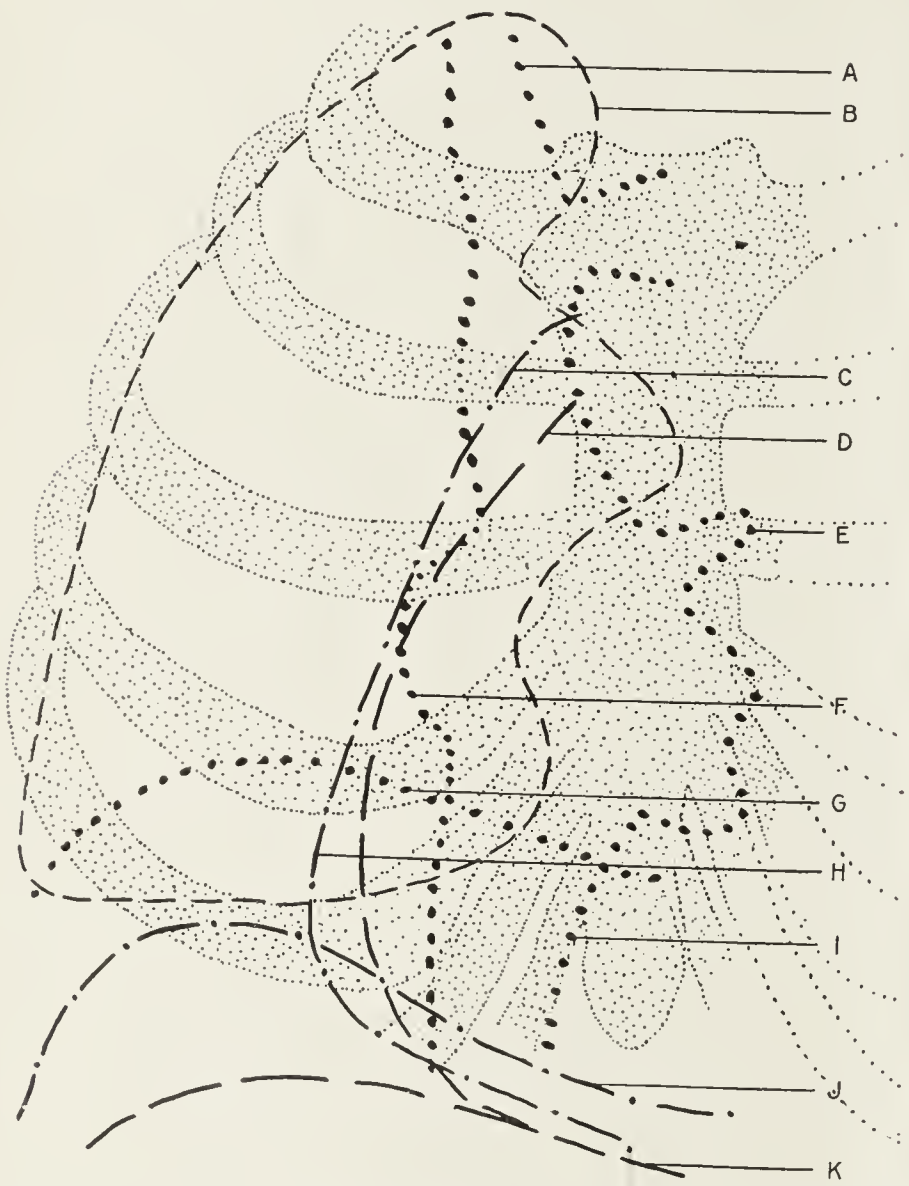

FIG. 1.—Here the front projection of an enlarged heart due to aortic stenosis is shown. Apex is beyond the anterior-axillary line. Heart is 6½ inches in transverse diameter. The right wall and diaphragm of two cases of pericarditis are also shown.

A represents the jugular vein, its continuation the superior cava; *B*, the anterior median border of right lung; *C*, right wall of pericardium with *J*, its corresponding diaphragm, of one case of pericarditis; *D*, right wall of pericardium with *K*, its corresponding diaphragm, of second case of pericarditis; *E*, left wall of right auricle; *F*, right wall of right auricle; *G*, diaphragm of heart case; *H*, lower portion of pericardial wall showing point of maximum displacement; *I*, inferior cava.

downward. This uniform displacement of the right wall of the pericardium displaces the lung outward from its root down to the diaphragm; and may also displace the root of the lung. As the root of the lung is displaced the anterior margin of the lung must go outward and upward, carrying with it the lower portion of the median border and angle of the lung. Or the displacement of the root of the lung causes a general displacement of the lung and accounts for a portion of the displacement of the lung at the lower right border of the sternum.

The downward displacement of the attachment of the right wall of the pericardium to the diaphragm permits that portion of the right wall of the pericardium which is most displaced to occupy a lower position than displacements of the right wall of the pericardium due to enlargement of the heart.

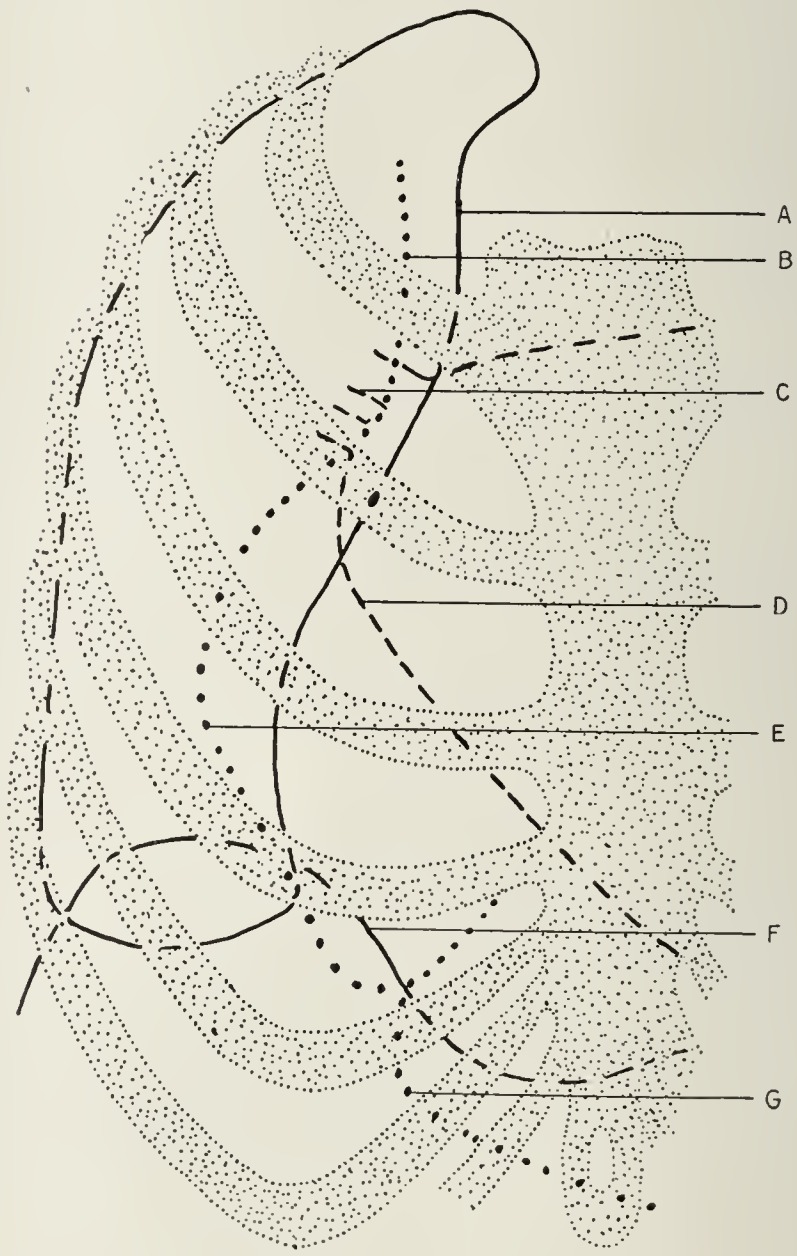

FIG. 2.—Anterior projection of a case of mitral stenosis. *A* represents the anterior median border of the right lung; *B*, the right wall of the superior cava which is continued downward as the right wall of the right auricle; *C*, pulmonic veins; *D*, right wall of the left auricle; *E*, right auricle; *F*, diaphragm; and *G*, right ventricle.

Compare in Fig. 1, *H* with *F* and with *E* in Fig. 2. The lowest position of the greatest displacement of the right wall is most favorable to the greatest displacement of the lower portion of the lung.

In pericarditis three factors are present to cause the dislocation of the lung:

1. Possible displacement of the root of the lung.

2. Pressure of the pericardium on the lung from its root to lower border.

3. Downward displacement of the attachment of the right wall of the pericardium to the diaphragm, thereby lowering the point of greatest displacement of the right wall of the pericardium.

In enlargement of the heart these factors are usually absent. Fig. 1, *H*, shows an anterior projection of a very large heart.

Fig. 2, shows an anterior projection of the right wall of the right auricle, right lung, and left auricle, of a case of mitral stenosis. The large area of absolute dulness to the right of the sternum and the great increase in the cardiohepatic angle are certainly exceptional and are due to mechanical effects somewhat different from those just described. Here the dilatation of the left auricle has displaced the root of the lung outward and upward, as shown in Fig. 2, *C*, which represents the location of the pulmonary veins. This displacement pulls the lower angle of the lung outward and upward. The dilated right auricle lying inferior to the root of the lung pushes the lower portion of the lung outward.

In enlargement of the heart and pericarditis two factors are necessary to materially increase the cardiohepatic angle:

1. Displacement of the root of the lung; either to the right; to the right and upward; to the right, upward, and backward; or backward and upward.

2. Displacement of the lower portion of the right wall of the pericardium, either by effusion or by very large dilatation of the right auricle.

The presence or absence of a decided increase in the cardiohepatic angle depends on the degree of development of factors 1 and 2. If factor 1 is absent, the area of absolute dulness to the right of the sternum will be minimum, for the reason that the displacement of the lung is local which can in a measure be compensated by the elasticity of the portion of the lung affected, Fig. 1, *F* and *B*. This is the usual finding in enlargement of the heart. Dilatation of the left auricle, giving factor 1, in the absence of dilatation of the right auricle, may cause only slight increase in the area of dulness to the right of the sternum. But the way is prepared for the lung, when the right auricle dilates, to slip, as it were, behind and above the heart, as shown in Fig. 2.

Clinically, the value of the cardiohepatic angle in pericarditis is not decreased in the early stages of the development of dilatation of the left auricle, because the signs of the mitral lesion would be present. In enlarged hearts the lesion must be determined before an increased cardiohepatic angle is differential for an associated pericardial effusion. In extreme dilatation of the heart, when differentiation from pericarditis is the most difficult, the cardiohepatic angle is of little value, unless the history of the case is known; even then it is, at best, uncertain. When pericardial effusion can be positively excluded, an increase in the cardiohepatic angle becomes a sign of mitral stenosis, because this lesion most frequently causes extensive dilatation of the left auricle and displacement of the root of the lung. When the history of the case is known, allowing heart lesions to be excluded, an increase in the cardiohepatic angle retains the value in pericarditis with effusion given to it by Ebstein and others.

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PROCEEDINGS OF SOCIETIES.

THE JOHNS HOPKINS MEDICAL SOCIETY.

February 3, 1908.

Meeting of the Johns Hopkins Hospital Medical Society, Dr. Finney presiding.

I. Exhibition of a Case of Combined Organic and Hysterical Paralysis. DR. THOMAS.

The patient, a male, a German immigrant who has been in this country two months, came to the dispensary 10 days ago complaining of numbness of the left arm. He said that two or three days before coming to the hospital, at three o'clock in the morning, he was awakened from a dream in which he saw his father, who had been dead for two years, come into his room and fire a pistol at him. He woke up and found his arm absolutely paralyzed.

Physical examination revealed total paralysis of the left arm, from the elbow down. In the distribution of the radial nerve, his hand felt numb. There was absolute anæsthesia all over the hand and up the arm as far as the elbow. The psychical shock, the great extent of the paralysis and the marked anæsthesia made the case look like one of hysteria; however in flexing the arm, which he did with nearly normal strength, it was found that the supinator longus did not act. It seemed so unlikely for hysteria to have paralysed one muscle in a group without any involvement of the others that a more probable explanation was that the patient had slept on his arm and the pressure made it numb, that the numbness induced the dream, and that on waking up and finding his arm numb, a hysterical paralysis occurred in addition to the organic museulo-spiral paralysis.

This case illustrated, in the author's opinion, the importance of always being on the lookout for organic lesions in a hysterical patient. It also exhibited some of the differences between an organic and hysterical paralysis.

An organic paralysis is due to a more or less permanent alteration somewhere in the nervous tissues: here it was a lesion of the musculo-spiral nerve caused by pressure during sleep. A hysterical paralysis, however, may follow psychical

shock: in this instance the dream was the exciting agent. As regards the distribution of the paralysis, an organic lesion involves muscles or movement in accordance with their localization in the nervous system, while a hysterieal paralysis is not based on anatomical boundaries. This patient's hysterical paralysis involved all the movements of the wrist and hand, but the fact that the supinator longus would not act during flexion of the elbow revealed the organic element, for it was hard to understand as hysterical a paralysis that picked out a single muscle from a group that acts together as a functional unit.

The subsequent course of events served to substantiate the early diagnosis, for following strong suggestion, the sensory loss had entirely disappeared, and the paralysis, except of those muscles supplied by the musculo-spiral nerve had largely cleared up within a few days.

II. Exhibition of Pathological-Surgical Specimens. Dr. Bloodgood.

Dr. Bloodgood gave a lantern demonstration of photographs and paintings of several rare cystic tumors of the thigh. The tumors included lymph cysts, blood cysts, and a few due to healed tubereulous cavities. Most of these appeared in the region of Scarpa's triangle. One was a cyst that resulted from a bursitis of the bursa covering an exostosis that arose from the great trochanter of the femur.

Discussion.

Dr. Finney.—Two or three weeks ago we operated on a cyst of the neck that was an example of a serous cyst with hæmorrhagic contents. It was a purely traumatic affair, though we found no particular vessel feeding it. It was just over the thoraeic duct.

I can recall two cysts of the groin. One patient that I have seen off and on for 15 years has come to my office within the last two weeks. This patient had had the cyst for 30 years. Following a slight injury recently the cyst suddenly inereased in size and beeame painful. With rest it has become pretty well again. In another case, in a woman, I thought the contents were probably bloody because by transmitted light the color was very dark. Since the tumor gave no particular trouble the patient would not allow treatment, not even aspiration.

Some of the cysts do not interfere with the patient's comfort and are to be removed only when some definite indication arises.

Dr. Hurd.—I recall that the late pope, Leo XIII, when nearly 90 years old had a cystic tumor removed from his thigh. Up to that time it had given him very little trouble.

Dr. Bloodgood.—Abont 10 or 12 years ago I was asked to see a cyst of the groin of three years' duration. The patient, a woman, insisted on operation. At that time we didn't know so much abont the ligation of blood vessels, and were disinclined to operate because we feared gangrene might result if the femoral artery were tied. The cyst was about the size of an orange, distinctly capsulated, and rested between the femoral artery and vein. We aspirated it and eauterized the lining. Just at that moment, blood welled out from the bottom almost as rapidly as though I had cut the femoral. I was anxious not to injure the vein, so I packed the cyst. The cyst leaked blood every now and then. The patient lived about five years and finally died of a secondary anæmia.

III. Enteritis with Meningeal Symptoms Followed by Multiple Neuritis. Dr. McCarty.

The speaker reported the history of a male child, aged 5 years, who had developed a definite and typical attack of meningitis. The symptoms continued for almost a month, when on aceount of the character of the stools which were foul smelling and eontained mueh mucus, undigested food, and occasional streaks of blood, it was thought that the meningeal symptoms might be due to the action of toxins absorbed from the intestinal tract. Treatment was instituted from this point of view and improvement was immediate and rapid. As the symptoms of meningeal irritation cleared up, it became evident that there was a symmetrieal paralysis of the legs. A definite peripheral neuritis of the lower extremities developed. The author thought that here the neuritis was also dependent on the circulating toxin which arose from the intestinal tract.

Discussion.

Dr. Cole.—This report of Dr. McCarty's brings to mind a case of intestinal intoxication with symptoms simulating a cerebral lesion, which was in the hospital some years ago. This child had unilateral convulsions. The illness eleared up with treatment directed toward the intestinal condition.

IV. Report of Gynæcological Cases. Dr. Cullen.

Dr. Cullen exhibited the gross specimen of a tumor that had been diagnosed clinically as a carcinoma of the cervex uteri. Anatomically it was a carcinoma of the body of the uterus with secondary implieation of the cervix. The growth had extended through the uterus and involved the walls of two intestinal loops.

He also reported a reeent case where there had been a primary eareinoma of the right ovary with secondary involvement of the left ovary; and in addition, the patient also had a primary carcinoma of the body of the uterus.

The third ease reported was found to have an adenomyoma of the body of the uterus, abscess of the left Fallopian tube, primary earcinoma of the left ovary and primary carcinoma of the uterus.

The speaker discussed possible accidents that ean result from draining through the vaginal vault. He stated that many gynæeologists have had deaths occur which were directly due to draining through this region; and reported one instance where the foreeps had been introdueed through the bladder and urethra instead of through the vagina, and another in which the forceps were carried up through the rectum. In both of these latter cases the mistake was discovered in time and the patient's life saved. The moral is that in every case the forceps should be introduced under sight.

In a case of simple perineal operation, on the fourteenth day following operation, the entire wound tore out after a constipated movement. Anæmia was probably the reason for the failure of the wound to heal. The patient recovered after a second operation.

A patient, whom the author saw recently, suffered an extremely serious hæmorrhage from the vagina after an accident in which she fell across a chair. No lesion was to be made out in the vagina, but just inside the labium was a very small clot which upon being squeezed emitted a tremendous spurt of blood.

Dr. Cullen also reported the case of a girl, aged 17 years, who had never menstruated. Examination revealed the entire absence of the vagina and the presence of a hard mass in the left side of the pelvis. At operation it was found that the distance between the bladder and rectum was only 2 mm. Both tubes and ovaries were in the inguinal canals. There was no uterus. The mass was extra-peritoneal and was found to be the right kidney, of twice normal size, lying in the pelvis. No trace of the left kidney was to be found.

V. A Case of Influenzal Meningitis. DR. COHOE.

D. R., a male, aged 36 years, was admitted to the hospital complaining of retention of urine, headache and backache. Two weeks before admission the patient had been struck over the left ear by a beer bottle, inflicting a scalp wound, following which he had remained in bed on account of dizziness and a cold in the head. On examination in the hospital, meningeal symptoms were found present. There was marked stiffness of the cervical muscles, a slight external strabismus of the right eye, and a very distinct Kernig's sign on both sides. The knees were kept flexed. A crop of herpes was noted at the angle of the mouth. The heart, lungs and abdomen were negative. The temperature on admission was 103° and pulse 80. For about eight days a fastigium of from 100-104° was maintained, after which the temperature assumed an amphibolous phase, becoming normal on the 15th day. The pulse was slow during the entire disease, frequently falling as low as 50. The respirations were normal throughout. An aural examination revealed a chronic otitis media of both ears. The eye examination showed both discs to be hyperæmic, œdematous and swollen. The pupils were equal and reacted to light and accommodation. The leucocytes on admission were 9000, rising slowly after four days to 13,000 and falling again to 10,000 on the first day of normal temperature. The blood pressure remained slightly below normal. The urine on admission showed a trace of albumen and a few hyaline and granular casts. There was retention of urine during the early days of the disease.

The patient, during the acute stage, was extremely restless, with alternating periods of stupor and delirium. Both meningeal and psychical symptoms gradually ameliorated and the patient left the hospital well in five weeks.

Lumbar puncture was performed three times. The fluid in each case was under high pressure, 250-400 mm., and slightly turbid. The cell content was found greatly increased, 1500 cells per cm., 87 per cent of which were polymorphonuclears. An examination of smears, stained with dilute carbolfuchsin, showed the presence of a few small, thick bacilli in a field, some of which were extracellular, and others intracellular. In the fluid from the third puncture the majority of organisms were found to be intracellular. Cultures of the fluid on blood agar gave a delicate growth of pin point, translucent, discrete colonies, of dewdrop appearance, in pure culture. Cultures on other media remained sterile. Subcultures grew only on hæmoglobin-containing media, best on pigeon's blood agar. Morphologically the organism was a short, thick, non-motile bacillus. It was Gram negative, staining best with dilute watery carbolfuchsin, and well with Bismark brown. The bacillus conformed in every respect biologically and morphologically with the B. influenzæ. Two blood cultures were made from the blood of the patient, both of which were negative. The serum of the patient was found not to contain specific agglutinins for the organism, and animal inoculation with the organism was without result.

February 17, 1908.

Meeting of Johns Hopkins Hospital Medical Society, Dr. Finney presiding.

I. Exhibition of Cases. Facial Paralysis Following Otitis Media. DR. REIK.

The speaker prefaced his remarks by recalling the fact that in December, 1901, he had discussed before the society the occurrence of so-called refrigeratory facial paralysis as a complication of certain cases of non-suppurative otitis media. At that time, in taking up the pathology of the affection, he was convinced that in the majority, if not in all, cases of this refrigeratory paralysis, an acute or subacute otitis media is an intermediate factor between exposure to cold and the paralysis. Statistics that include all cases of facial paralysis would indicate that from 2 to 4 per cent were due to trauma, from 2 to 4 per cent to lues and about 70 per cent to exposure to cold. The speaker thought that exposure to cold produces an otitis media, and in cases when the facial nerve is exposed in the tympanic cavity, there occurs pressure on the nerve or a direct extension of the infection to the nerve, either of which agents may give rise to the palsy. All three cases, when the nerve was examined microscopically, showed the existence of a pressure paralysis; there was a parenchymatous and not an interstitial change.

In the past few years Dr. Reik has never failed to find some affection of the middle ear in all cases of this palsy. In making a study of temporal bones, he noted that in one-half of all normal bones, the facial nerve is exposed in the inner wall of the tympanic cavity. In all other regions the facial nerve is very well protected.

The ordinary history of these cases is that of a patient who after exposure develops an acute otitis media, associated with a slight cold. He goes to bed, feeling pain in the ear and wakes up the next morning with distortion of the face.

The case exhibited was that of a man, who came to the dispensary on February 5, complaining of discomfort in the left ear, stiffness, mild pain and deafness. He had an acute

catarrhal otitis media without bulging. On February 7, he was better and felt no pain, but there were still marked congestion and evidences of exudate. On February 14, he returned to the dispensary and said he had felt better for a few days, but that on February 13, he had suffered an increase of his symptoms and woke up the next morning with a facial paralysis. Examination revealed a bulging tympanic membrane, and paracentesis allowed the escape of a sterile secretion. Following the paracentesis his condition improved immediately, and 72 hours after the operation, except for a little weakness of his muscles, he had almost completely recovered from his paralysis.

Recovery is generally slow without treatment. After paracentesis it is almost immediate and rapid. As an aid to diagnosis of the ear condition, the hearing should always be tested.

Discussion.

Dr. Cushing.—I should like to ask Dr. Reik whether he has observed auricular herpes in any of these cases.

Dr. Reik.—I have not personally seen it, but I have heard of its occurrence.

Dr. Cushing.—It is very difficult for one to see how a little pressure can cause facial paralysis. There have been a number of cases of facial palsy reported in which there has been a lesion of the posterior geniculate ganglion and they do not have to have an outcrop of herpes. I have been inclined to think that some of these cases might be due to an affection of the geniculate ganglion.

II. Standards of Medical Education in this Country. Dr. Bevan, Chicago, Ill.

A summary will appear later.

NOTES AND NEWS.

THE CENTRAL COMMITTEE OF THE INTERNATIONAL CONGRESS ON TUBERCULOSIS HAS ANNOUNCED THE OFFER OF THE FOLLOWING PRIZES:

I. A prize of $1000 is offered for the best evidence of effective work in the prevention or relief of tuberculosis by any voluntary Association since the last International Congress in 1905. In addition to the prize of $1000, two gold medals and three silver medals will be awarded. The prize and medals will be accompanied by diplomas or certificates of award.

Evidence is to include all forms of printed matter, educational leaflets, etc.; report showing increase of membership, organization, classes reached—such as labor unions, schools, churches, etc.; lectures given; influence in stimulating local Boards of Health, schools, dispensaries, hospitals for the care of tuberculosis; newspaper clippings of meetings held; methods of raising money; method of keeping accounts.

Each competitor must present a brief or report in printed form. No formal announcement of intention to compete is required.

II. A prize of $1000 is offered for the best exhibit of an existing sanatorium for the treatment of curable cases of tuberculosis among the working classes. In addition to the prize of $1000, two gold medals and three silver medals will be awarded. The prize and medals will be accompanied by diplomas or certificates of award.

The exhibit must show in detail construction, equipment, management, and results obtained. Each competitor must present a brief or report in printed form.

III. A prize of $1000 is offered for the best exhibit of a furnished house, for a family or group of families of the working class, designed in the interest of the crusade against tuberculosis. In addition to the prize of $1000, two gold medals and three silver medals will be awarded. The prize and medals will be accompanied by diplomas or certificates of award. This prize is designed to stimulate efforts towards securing a maximum of sunlight, ventilation, proper heating, and general sanitary arrangement for an inexpensive home. A model of house and furnishing is required. Each competitor must present a brief with drawings, specifications, estimates, etc., with an explanation of points of special excellence. Entry may be made under competitor's own name.

IV. A prize of $1000 is offered for the best exhibit of a dispensary or kindred institution for the treatment of the tuberculous poor. In addition to the prize of $1000, two gold medals and three silver medals will be awarded. The prize and medals will be accompanied by diplomas or certificates of award.

The exhibit must show in detail construction, equipment, management, and results obtained. Each competitor must present a brief or report in printed form.

V. A prize of $1000 is offered for the best exhibit of a hospital for the treatment of advanced pulmonary tuberculosis. In addition to the prize of $1000, two gold medals and three silver medals will be awarded. The prize and medals will be accompanied by diplomas or certificates of award.

The exhibit must show in detail construction, equipment, management, and results obtained. Each competitor must present a brief or report in printed form.

VI. The Hodgkins Fund Prize of $1500 is offered by the Smithsonian Institution for the best treatise that may be submitted on "The Relation of Atmospheric Air to Tuberculosis."

The detailed definition of this prize may be obtained from the Secretary-General of the International Congress or Secretary of the Smithsonian Institution, Chas. D. Walcott.

VII. Prizes for Educational Leaflets:

A prize of $100 is offered for the best educational leaflet submitted in each of the seven classes defined below. In addition to the prize of $100, a gold medal and two silver medals will be awarded in each class. Each prize and medal will be accompanied by a diploma or certificate of award.

Competitors must be entered under assumed names.

A. For adults generally (not to exceed 1000 words).
B. For teachers (not to exceed 2000 words).
C. For mothers (not to exceed 1000 words).
D. For in-door workers (not to exceed 1000 words).
E. For dairy farmers (not to exceed 1000 words).
F. For school children in grammar school grades (not to exceed 500 words).

In classes A, B, C, D, E, and F, brevity of statement without sacrifice of clearness will be of weight in awarding. All leaflets entered must be printed in the form they are designed to take.

G. Pictorial booklet for school children in primary grades and for the nursery.

Class G is designed to produce an artistic picture-book for children, extolling the value of fresh air, sunlight, cleanliness, etc., and showing contrasting conditions.

"Slovenly Peter" has been suggested as a possible type. Entry may be made in the form of original designs without printing.

VIII. A gold medal and two silver medals are offered for the best exhibits sent in by any State of the United States, illustrating effective organization for the restriction of tuberculosis. Each medal will be accompanied by a diploma or certificate of award.

IX. A gold medal and two silver medals are offered for the best exhibits sent in by any State or Country (the United States excluded), illustrating effective organization for the restriction of tuberculosis. Each medal will be accompanied by a diploma or certificate of award.

X. A gold medal and two silver medals are offered for each of the following exhibits; each medal will be accompanied by a diploma or certificate of award; wherever possible each competitor is required to file a brief or printed report:

A. For the best contribution to the pathological exhibit.

B. For the best exhibit of laws and ordinances in force June 1, 1908, for the prevention of tuberculosis by any State of the United States. Brief required.

C. For the best exhibit of laws and ordinances in force June 1, 1908, for the prevention of tuberculosis by any State or Country (the United States excluded). Brief required.

D. For the best exhibit of laws and ordinances in force June 1, 1908, for the prevention of tuberculosis by any municipality in the world. Brief required.

E. For the society engaged in the crusade against tuberculosis having the largest membership in relation to population. Brief required.

F. For the plans which have been proven best for raising money for the crusade against tuberculosis. Brief required.

G. For the best exhibit of a passenger railway car in the interest of the crusade against tuberculosis. Brief required.

H. For the best plans for employment for arrested cases of tuberculosis. Brief required.

XI. Prizes of two gold medals and three silver medals will be awarded for the best exhibit of a workshop or factory in the interest of the crusade against tuberculosis. These medals will be accompanied by diplomas or certificates of award.

The exhibit must show in detail construction, equipment, management, and results obtained. Each competitor must present a brief or report in printed form.

The following constitute the Committee on Prizes:

DR. CHARLES J. HATFIELD, Philadelphia, *Chairman.*
DR. THOMAS G. ASHTON, Philadelphia, *Secretary.*
DR. EDWARD R. BALDWIN, Saranac Lake.
DR. SHERMAN G. BONNEY, Denver.
DR. JOHN L. DAWSON, Charleston, S. C.
DR. H. B. FAVILL, Chicago.
DR. JOHN B. HAWES, 2D, Boston.
DR. H. D. HOLTON, Brattleboro.
DR. E. C. LEVY, Richmond, Va.
DR. CHARLES L. MINOR, Ashville, N. C.
DR. ESTES NICHOLS, Augusta, Me.
DR. M. J. ROSENAU, Washington.
DR. J. MADISON TAYLOR, Philadelphia.
DR. WILLIAM S. THAYER, Baltimore.
DR. LOUIS M. WARFIELD, St. Louis.

NOTES ON NEW BOOKS.

Text-Book of Ophthalmology. By DR. ERNST FUCHS. Translated by ALEXANDER DUANE, M. D. Third edition. (*Philadelphia: J. B. Lippincott & Co., 1908.*)

Although it has been several years since the last edition of Duane's translation of Professor Fuchs' Text-Book of Ophthalmology appeared, yet up to the present time it has been quite rightly regarded as the best text-book on ophthalmology in English.

The progress of time, however, has brought with it new ideas in pathology and treatment, and these have been incorporated in the volume which we now have before us. The book covers the subject of ophthalmology in such a clear, thorough, and complete fashion that one unconsciously realizes that it is the work of a master. The book is thorough and complete, and yet it is written with so much conservatism that it is especially well adapted to the needs of the beginner in ophthalmology, as well as of the more advanced worker. The anatomy and pathology of the eye are thoroughly gone into and the discussion of the various diseases (and lesions) of the eye is so complete and accurate that we have practically a perfect text-book of ophthalmology, which is most satisfactorily adapted to the needs of the student of medicine, general practitioner, or specialist.

As in the previous edition, Dr. Duane, the translator and editor, has added many valuable comments which the American reader will much appreciate.

This text-book deserves to rank as a great modern medical classic and Professor Fuchs has, through the efficient and able editorship of Dr. Duane, put at the disposal of the medical reading public in America a peerless text-book on the subject of ophthalmology.

B. B. BROWNE, JR.

A Text-Book of Physiology. By ISAAC OTT, A. M., M. D., Professor of Physiology in the Medico-Chirurgical College of Philadelphia, etc. Second edition, revised and enlarged. (*Philadelphia: F. A. Davis Company, Publishers, 1907.*)

There are two factors upon which depend the value of a review. In the first place, there is the reviewer's knowledge of the subject, and in the second place, his acquaintance with the book reviewed. The first factor is indicated by the signature which follows the review; the second is the reviewer's own secret. The reader is, of course, interested in the opinion of the reviewer but would like mightily to know upon what that opinion is based, and, since it is only fair to him and to the author of the book reviewed, I shall say at once that I have read with great care the chapter on the circulation, that part of the chapter on the respiration most likely to be wrong, and have merely glanced at the rest of the book.

The defence of Archias being easy, Cicero spends his time in the praise of letters, and similarly, finding the text-book in question very vulnerable, I prefer to write on physiological text-books in general, while illustrating my points by means of this one in particular.

There is, perhaps, nothing which indicates our over-specialization so clearly as the inability of most scientists to write English. It is true that orthography may be left to the proof-reader, but to neglect Grammar, Logic, and Rhetoric (Lucidity's three handmaidens) is really a serious matter. A few examples will make this point clear.

Bad grammar. I. "If, now, there be a flow of the liquid it will be because of a difference of pressure at the reservoir and

the outlet due to gravitation" (p. 265). That which is due to gravitation is the pressure not the difference in pressure.

Unusual diction. I. The blood-pressure may be raised by "the heart beating more vigorously and more completely and sending more blood into the aorta at each beat" (p. 271). Can the student be expected to know that "a completely beating heart" is one which is emptying itself completely? II. "An isotonic solution (0.7% NaCl) is necessary to keep the heart beating; but to keep the contractions going, calcium must be added, ..." (p. 245). Is there any obvious difference between "keep beating" and "keep going" in the sentence just quoted?

Carelessness of expression. I. "This [the pulse] wave is not an actual movement of the particles of the blood but a transmission of the impulsion of the heart throughout the length of the arterial tree" (p. 255). By "actual movement" is here meant a movement of translation as contrasted with an oscillatory movement. II. "The resistance which the blood meets with in the more or less shrunken vessels is generally designated by the misnomer *friction*" (p. 274). By "friction" is here meant external friction as contrasted with internal friction, which is the real cause of the resistance.

Bad logic. I. "Because of the considerable amount of muscular and elastic fibers present in the walls of the arteries, they (unlike the veins) are usually found empty and dilated after death" (p. 246). One might as well say "Because I have legs I run before breakfast." To be sure, if I had no legs I could not run at all, but would the possession of legs be regarded as a sufficient explanation of the phenomenon mentioned? II. "The total capacity of the capillaries is about three hundred times that of the arteries, so that in them much of the blood-pressure is lost, ..." (p. 249). By the same logic, the capacity of a steam boiler is three hundred times that of the gauge pipe, therefore the pressure is lower in the boiler than in the gauge pipe.

Over-condensation. I. [1] "Even after curarization, irritation of the central end of the depressor lowers the arterial tension. [2] If the splanchnics are previously divided, stimulation of the depressor has hardly any effect. [3] After an injection of pyocyanin, which paralyses the vasodilator centers, irritation of the depressor does not lower the arterial tension. [4] Porter and Beyer have shown that it dilates the arterioles throughout the body, and especially the blood-vessels innervated by the splanchnics" (pp. 238-9). To the thoughtful student this suggests only a series of questions. If [3] is true how is it that [2] is true, seeing that the splanchnics are poor in dilators? What is the significance of [1]? If [2] is true has [4] any importance at all? Now is it good pedagogics to present such an incomplete picture to the student?

Agglutination. By this I mean the stringing together of a lot of more or less disconnected statements, a style admissible in the book of proverbs but not to be encouraged in text-books. As an example of this we have the passage already cited under the heading "Over-condensation."

Apart from the English there are some other defects to be found to a greater or less extent in all text-books. They are the following:

All text-books are more or less behind the times. In the case of physiology, this is not remarkable for the field is so enormous. We expect to find in every writer of a text-book a certain amount of unfamiliarity with some of the most recent literature. It is not well, however, to demand of the student too much indulgence as in the examples to be given.

I. "By reason of this blood-distension the auricles become excited to contract. The blood is rushed into the ventricles, dilating them to their maximum. From distension produced in them and also from the ganglionic impulses which were not efficacious except at this moment, the ventricles are made to contract in their turn" (p. 230). II. "When the accelerator fibers are divided, the rhythm of the heart remains unchanged. This proves that the accelerator center is not constantly in a state of tonic excitement" (p. 241). This statement is not in accord with the work of Hunt published in 1897. III. ". . . . in the vagus we have fibers of two kinds: one calling out expiration when an ordinary inspiration of air is made, the other calling out inspiration when an ordinary expiration is made. So that every act of inspiration calls out an expiration and every act of expiration calls out an inspiration" (p. 333). This is the old Hering-Breuer theory. Since that theory was put forth the work of Gad, Lewandowski, Boruttau, Head, Schenck, and finally Alcock and Seeman has added much to our knowledge of this subject. The latter may be summed up as follows: 1. The normal stimulus to inspiration is chemical. 2. The vagus contains one set of fibers which is stimulated during normal inspiration by the distension of the lungs and which has an inhibitory action upon the inspiratory movements. 3. The vagus contains a second set of fibers which act upon the inspiratory center causing an inspiration. These fibers are stimulated by abnormal collapse of the lungs, that is only when the expirations are forced. 4. Thus the active respiratory movements are cut short by nervous action while those which are passive in character are self-limited.

No text-book tells the whole truth. Of course not. The pedagogic value of a text-book depends as much on what is left out as upon what is stated. This process of elimination may, however, be carried too far. The conception of the cerebral circulation presented by Leonard Hill some eight or ten years ago may be very simple and pleasant to teach, but to ignore all the work which has been done since then results in giving a very false impression to the student (see p. 279).

All text-books are more or less ultra-conservative. This may result in several sorts of defects.

1. *Lack of originality.* It is naturally difficult to be original in writing a text-book, but a wholesale copying of figures and demonstrations from other text-books should be avoided as far as possible. Where such copying is done without proper appreciation of the original author's meaning, the result is often a series of contradictions, such as the following: After the statement that the accelerators are without tone (p. 241), one reads "Thus, atropine paralyses the post-ganglionic fibers [of the vagus], thereby giving the accelerators full sway, the consequence being augmentation of the heart's beats" (p. 242). II. The theory of the heart beat (p. 230) has already been referred to (see above). Further on we read of the view of Engelmann and Gaskell and of the phenomena of Stokes-Adams disease, regarding which it is said "These facts favor the myogenic theory of cardiac contractions" (p. 232). It should of course be remembered that the auriculo-ventricular bundle contains nerve fibers so that its discovery has in no way settled the neuromyogenic controversy.

2. *The perpetuation of old errors.* In this connection I shall give an example which is found in almost all text-books, including the one under discussion (p. 272). The waves described by Traube (L. Traube: Centralblatt f. d. medicinischen Wissenschaften, 1885, p. 800; also Gesammte Abhandlung) and Hering (Ewald Hering: Wiener Sitzungsberichte, LX, 2, p. 829) were vasomotor waves synchronous with the respiration and probably due to irradiation from the respiratory to the vasomotor center. These waves are especially evident in anesthetized animals with open thorax during partial asphyxiation. The long waves which are not synchronous with the respiration but may be very much longer were described by Sigmund Mayer and should be called either Mayer's waves or simply waves of the third order (see L. Fredericq: Arch. f. (Anat. u.) Physiol., 1887, 351).

3. *The perpetuation of customs generally recognized as bad.* Indifference to the C. G. S. system is not usually to be met with

among scientists. It is therefore surprising to find that the book under discussion uses now one system and now another. This is probably due to the habit of borrowing passages from other books, a tendency which has been referred to under 1. Another custom, which is fortunately fast disappearing, is the incorporation into physiologic text-books of a considerable amount of anatomy and histology and sometimes (not however in the book in question) of other extraneous matter.

The objects of this review have been to point out certain difficulties and dangers which beset the writers of text-books of physiology and also, incidentally, to emphasize certain physiologic facts, which are generally overlooked. For the former the chapter on the circulation has proved a mine of illustrations. What errors and excellences the other chapters contain I cannot say, but I can state positively that any one reading the book may omit with profit the ninety-seven pages devoted to the circulation.

PERCY M. DAWSON.

Diseases of Infancy and Childhood: Their Dietetic, Hygienic, and Medical Treatment. By LOUIS FISCHER, M. D., Visiting Physician to the Willard Parker and Riverside Hospitals of New York City. Price $6.50. (*Philadelphia: F. A. Davis Company, Publishers, 1907.*)

It can hardly be said that there is need at present for another text-book covering the whole range of pediatrics, unless it contains features of special interest not adequately considered in similar books already accessible.

Dr. Fischer's book has more the character of a compilation of facts and opinions gathered at random from many sources than that of a uniformly authoritative treatise.

In the opening chapter on development and hygiene of the infant, one is surprised to find approval of the old treatment of inflamed gums by the use of laudanum in the middle ear. Abnormalities and diseases of the newly-born are rather completely catalogued in the next chapter and the more important ones discussed.

Apparently much effort was taken to make the chapter on feeding comprehensive. The newer chemical work on breast milk is outlined. The recent German literature on the subject has been freely drawn upon. Many authors are quoted at length. The method of presentation, however, does not give the impression of a well-considered, orderly résumé of the literature or even the more valuable results of personal experience. Certain exceptions must be taken to some of the statements in this portion. Proprietary preparations are rarely of service as galactagogues when simpler measures, such as milk, cocoa, and corn-meal mush, fail. The great service rendered infant feeding by the cereal gruels has received scant attention, and the top-milk feeding has proved itself too useful a method in many hands to be summarily dismissed. The practice of scalding the milk mixtures as recommended by Dr. Fischer is not necessary when milk of the highest standard is used and properly refrigerated, as in this manner of heating are brought about nearly all the changes produced by sterilization. The problem of feeding delicate children is not solved by the dextrinizing of the food as intimated on page 155. The author's experience with the Walker-Gordon Laboratory is unfortunate. Undoubtedly materials of first quality are offered to the profession at these laboratories. The success which attends their use depends largely on the kind of combinations ordered by the physician.

Apart from the question of feeding, one comes upon many surprising assertions. Considering the frequency of apthous stomatitis, the assumption that all cases are due to foot and mouth disease in the cows is quite unwarranted. The resort to surgery in cases of well-marked stenosis of the pylorus should not be delayed as a study of the pathology of the condition, which is not mentioned, indicates how little benefit may be hoped from paliative treatment.

Cyclic vomiting is too definite a symptom-complex to be cursorily dismissed.

The statement quoted from Park that the Shiga variety of dysentery "is present in all stools in New York City which contain mucus and blood" differs markedly from experience elsewhere. The more frequent organism in dysenteric stools in children belongs to the so-called Flexner type. The use of antidysenteric serum against this latter form of infection has not proved of much value.

The discussion of the congenital cardiac diseases is inadequate. The most frequent defect in these cases, namely, open auricular or ventricular septa, is hardly mentioned.

It is to be hoped that the advice to delay surgical intervention when there is reason to suspect pus in the abdominal cavity will not be followed, and that much reliance will not be placed in antistreptococcus serum in the treatment of tuberculous peritonitis.

The term, coli-cystitis, suggested in the book is apt to be misleading unless the spelling is noticed, and is, therefore, unfortunate.

The statement that scrofulosis will be the media through which later on tuberculosis develops, reminds one of the old fear that a bad cold might turn into consumption.

The most satisfactory portion of the work is that treating of the acute exanthematous diseases and of diphtheria. In this field Dr. Fischer's unusual experience gives him real authority. The discussion of laryngeal stenosis with the statistical account of the best methods of intubation is particularly full and valuable.

The concluding chapters on diseases of the nervous system, ear, eye, skin, and of the spine and joints, contain a brief résumé of the more important affections of these parts.

The book is concluded by a number of dietary and therapeutic suggestions, and by a short account of the methods for gastric and urinary analyses.

J. H. M. K.

Syphilis. A Treatise for Practitioners. By EDWARD L. KEYES, JR., M. D., Clinical Professor of Genito-Urinary Surgery, New York Polyclinic Medical School and Hospital, etc. (*New York and London: D. Appleton and Company, 1908.*)

It is a pity that a doctor who has had such a wide experience as Dr. Keyes in syphilis should not have written a better work, to which the term "pot-boiler" can be fairly applied. It is also a poor example of book-making. There is nothing new nor of value in this treatise, and the chapters are loosely strung together, and needless repetition is frequent. The proof-reading has been carelessly done and the author's English is not above par. There are many statements to which just exception may be taken. The morality of the following sentence can hardly be approved: "To prohibit matrimony in a given case may wreck a man's life more completely than syphilis could blast his wife's, and though this consideration can have no force in the first two years of the disease when infection is all but certain, in the fourth and fifth years one may make exceptions *for adequate social cause* [the italics are the reviewer's], and with due precautions, deeming the possibility of infection light in comparison to the certain despair implied by delay." As long as there is any possibility of infection marriage should be prevented as far as possible, in view of the fact that syphilis is perhaps the most horrible disease which prevails.

As mucous patches are one of the most common recurrences in this disease, and as they are the most virulent source of infection, it can hardly be true that "syphilis in the male ceases to be transmissible to wife or to child within five years in practically every instance, and under any circumstances of neglect and inefficient treatment."

On page 116, speaking of the diagnosis of syphilis the author says: "The only specific reaction at present available is the

Justus test," but a few lines below he adds "as it sometimes gives positive results in non-syphilitics, and negative findings even in actively syphilitic cases, it is of no clinical importance." If this is so the test should not be called "specific."

"*If the lesion does not yield to the usual doses, the way to a cure is not* through an increase in dose, etc." (p. 179). "In order to control a lesion otherwise unmanageable, insoluble injections may be given until the lesion begins to yield, etc." (p. 179). These two statements need to be reconciled.

It seems hardly justifiable to speak of embolism as a "petty inconvenience in comparison with the benefits sometimes to be derived from their use [insoluble injections]."

Why should "proprietary" ointment bases be recommended (p. 185) where other bases can equally well be used?

How is the air to be removed from the syringe in the following description? "Then fill the syringe with the solution to be employed, and note whether any blood is oozing from the needle; if so, change its location; if not, screw on the syringe, aspirate the minute bubble of air from the needle and inject the solution."

It does not seem likely that when inunctions are used much mercury can be inhaled from its evaporation from the surface of the body, and yet in a foot-note on page 187, it is stated "but it would seem that with the ordinary method of inunction, fully as much mercury is absorbed by the skin as is inhaled." Probably far more.

Although the author describes all the important methods of administering mercury, and mentions the "Intratracheal Injection" in large type, he gives no description of this method (p. 190).

"Chancroid, though probably more virulent, is less venereal, since it recognizes many methods of infection other than sexual congress" (p. 208). "Not once in a thousand cases does one see a chancroid except about the genitals. This is as much as to say that it is practically always acquired by sexual contact" (p. 209). Such carelessness in writing, such contradictions are inexcuseable.

It would be easy to add many more comparisons to prove how little attention has been given by the author to the production of this work, but it is not worth while. The book does not deserve more attention or note. A few of the misprints noted may be found on pages 156, 175, 179, 183, 342, 527. R. N.

Preliminary Nursing Technique for First-Year Pupil Nurses. By Isabel McIsaac, Late Superintendent of the Illinois Training School for Nurses, etc. (*New York: The Macmillan Company, 1907.*)

For the use of pupil nurses at the beginning of their training, this little book has been prepared by a teacher of nurses well-known for the excellence of her methods, who in it embodies the results of her many years of varied experience as the head of the largest training school in this country.

The book fulfills admirably its author's purpose in providing a simple manual which describes in detail the methods necessary to carry out efficiently the various procedures of nursing. The book is carefully written; the instructions are clear and concise. There is a good chapter on baths in which, in emphasizing the necessity of drill, the writer states that giving her first bath to a patient is like the first attempt to ride a bicycle or to skate, and that skill is only reached by repeated and painstaking efforts. In this chapter, however, one is constrained to note, and to question the necessity for, the following statement: "The water should never be used a second time, nor for another patient."

In the chapter on the administration of medicines, one finds the excellent suggestion that a small book giving dosages, and antidotes to poisons, be kept in every hospital medicine closet.

The book, though small, is quite comprehensive and eminently practical and reliable, and should prove a safe guide for young nurses.

Hematological Atlas, with a Description of the Technic of Blood Examinations. By Priv. Doz. Dr. Karl Schleip, Scientific Assistant in the Medical Clinic University of Freiburg i/B. English Adaptation of Text by Frederic E. Sondern, M. D., Professor of Clinical Pathology New York Post-Graduate Medical School and Hospital. With 71 colored illustrations. Price $10. (*New York: Rebman Company.*)

This volume presents a collection of lithographic plates of the blood in normal and pathological conditions with a brief descriptive text, including also directions for making blood examinations.

The plates are for the greater part excellent, with here and there only a fault in registration.

They have the limitation that they are made from preparations with Romanowsky stain and have all the faults incident to this method, especially in reference to granular differentiation. They are slightly diagrammatic in that they portray a sharpness of granular stain rarely obtained by any Romanowsky process.

The plates of the anæmias and leukæmias are excellent as pictures with the eosin-azure methylene-blue stain.

The plates of malarial infections and trypanosomiasis are not up to the average standard of excellence in the rest of the work.

Auscultation and Percussion, together with other methods of physical examination of the chest. By Samuel Gee, M. D., etc. Fifth edition. Price $1.50. (*New York and London: Oxford University Press, 1907.*)

For a thorough knowledge of the signs of disease, the first essential is a clear understanding of the principle upon which are based the methods of investigation. It is too often the case that, in text-books on physical diagnosis, lengthy descriptions are given of the changes which occur in disease, without endeavoring to make clear on what physical laws the alterations are dependent. As the author states in his introductory note, the first part of the volume under review "treats of physical signs in the abstract—the pure science of physical signs." A lucid account is given of the theory of auscultation and percussion, without a grasp of which their application is of little value. The second part, which deals with physical signs as altered by disease, contains little that is new. It is, however, written in an original and pleasing manner, and cannot fail to attract the attention of both teacher and student. It is seldom that one reads a work of this kind which is written in a more refreshing and dignified style. This little book can be recommended not only to the medical student, who is studying physical diagnosis for the first time, but also to the general practitioner. H. A. S.

Heart Disease and Thoracic Aneurysm. By F. I. Poynton, M. D., Lond.; F. R. C. P., Lond., etc. Price, $1.50. (*New York and London: Oxford University Press, 1907.*)

The object of this manual is to give an outline of the more important cardiac affections. No attempt is made to enter into the subject in detail, as such would be impossible within the scope of the book; still, one is struck with the large accumulation of facts which have been collected into so small a compass.

In its general arrangement, the book differs from others bearing on the same subject in that rheumatic affections of the heart are taken as type of cardiac lesions. As in many works, however, which are of the nature of a "multum in parvo," a somewhat dogmatic attitude is adopted. In many respects the author has made the book well abreast of the recent advances in the study of cardiac affections. The chapter on the neuromuscular diseases is an excellent summary of our knowledge up to date. In two respects the book may be adversely criticised. Too little attention is given to the functional disorders of the circulation and the means by which they are diagnosed, viz., cardiographic methods. A more typical venous tracing might well be substituted for that which is reproduced from Gibson and Russel's manual. No mention is made of the altered rhythm which may

appear in myocarditis, especially that form associated with chronic nephritis. The presystolic gallop rhythm is now recognized as one of the most marked features of this condition. An expanded index would be an improvement. H. A. S.

Modern Clinical Medicine. Diseases of the Nervous System. Edited by Archibald Church, M. D. Translated by Julius L. Salinger, M. D. Price $7 net. (*New York and London: D. Appleton & Co., 1908.*)

Doubtless most of our readers are familiar with the series of which this volume is one, and which are translations of "Die Deutsche Klinik." The present volume contains thirty-two chapters or sections by almost as many writers. Naturally we find an author associated with the subject to which he has given most attention or with which we are apt to associate him on account of the fame he has gained in connection with it. For example, we find Lumbar Puncture by Quincke, The Symptom-complex of Aphasia by Wernicke, and Hysteria by Ziehen. With such a plan we naturally expect to find that each subject is treated in a masterly manner and to have a feeling that what we read is the opinion of an expert on the subject. Usually this is the case but sometimes not, as in Quincke's article on Lumbar Puncture, which is considerably behind the times and, in regard to cytological findings, is practically valueless. There is so much that is good in the article that this seems strange, until on examination of the literature appended we find no later reference than 1902, which was probably the year that Quincke wrote the article, and in criticising it we must judge it from a standard of at least five years ago. Of the editor, however, our criticism may perhaps be more severe, as he has failed in his duty of bringing the work up to date. Of the section upon Tabes Dorsalis by Erb, we find on the other hand but little to criticise, and the subject is adequately disposed of.

In so large a book as this, 1160 pages exclusive of the indexes, it is possible to find much to criticise, but there is much more to commend, and we believe it to be a valuable work for those who do not have the opportunity to become familiar with the most recent literature, and to those who find German difficult the book will be especially valuable. Mechanically, the book is attractive and the illustrations are all very good. W. R. D.

Chemical Pathology: Being a Discussion of General Pathology from the Standpoint of the Chemical Processes Involved. By H. Gideon Wells, Ph. D., M.D., Assistant Professor of Pathology in the University of Chicago and in Rush Medical College, Chicago. 549 pages. (*Philadelphia and London: W. B. Saunders Company, 1907.*)

Various works on chemical pathology have appeared from time to time in which selected topics have received treatment, but so far as the reviewer is aware this is the first "Discussion of General Pathology from the Standpoint of the Chemical Processes Involved."

The subject-matter of the book is divided into the following chapters: Chemistry of the Cell; Enzymes; Bacteria and their Products; Animal Parasites; Immunity; Chemical Means of Defence against Poisons of Known Composition; Phytotoxins and Zootoxins; Hemolysis and Cytotoxins; Inflammation; Diseases of the Circulation and of the Blood; Edema; Retrogressive Processes; Calcification, Concretions, and Incrustations; Pathological Pigmentation; Tumors; Metabolism and Autointoxication; The Ductless Glands; Uric Acid Metabolism and Gout; Diabetes. These important subjects are treated in a most interesting manner and apparently nothing of great importance in the literature has been overlooked, which testifies to the wide reading of the author. The style is clear and concise and the well-selected references to the literature will enable those who want to go deeper into the subject to find the literature on any particular topic. The author is to be congratulated on the excellent result of his arduous labor.

The author states that the first three chapters are for the benefit of those who are unacquainted with the modern developments of physiological chemistry. It is to be hoped that in subsequent editions these may be omitted because of the complete recognition of the fundamental importance of physiological chemistry for medicine. Biological chemistry has had a severe struggle for proper recognition in America and even now it is not accorded equal rank with anatomy, physiology, pharmacology, and pathology in many of our greatest universities. The appearance of Dr. Well's book on the pathological branch of the subject may be taken as a hopeful sign that the medical profession is coming to a realization of the importance of biological chemistry and that it will soon be granted the position and dignity among the medical sciences which it deserves. A. S. Loevenhart.

Psychology Applied to Medicine. Introductory Studies. By David W. Wells, M. D. $1.50 net. (*Philadelphia: F. A. Davis Company, 1907.*)

This little book of 141 pages is divided into nine chapters, entitled Reason and Instinct, Habit, Sensation, Experimental Psychology, Hypnosis-Historical, Hypnosis-Phenomena, Hypnosis-Theories, Psychotherapeutics, and Psychic Element in Medicine. The author presents his subject in a very elementary way and also very entertainingly, using poetry or interesting stories to illustrate when he so desires, and this point of making his book very readable constitutes its chief charm. Its chief defect is that it is so elementary, but as it was written especially for the author's class in the Boston University Medical School, a homeopathic institution, he has probably done wisely in not attempting to force too much of a subject generally regarded as dry upon a group of students.

The book is attractively bound and printed and the illustrations are good. W. R. D.

Modern Otology. By John F. Barnhill, M. D., Professor of Otology, Laryngology, and Rhinology, Indiana University School of Medicine, and Ernest deWolfe Wales, B. S., M. D., Associate Professor of Otology, Laryngology, and Rhinology, Indiana University School of Medicine. 305 illustrations, many in colors. Price $5.50. (*Philadelphia and London: W. B. Saunders Company.*)

The preface to this book states that the authors had in mind, during its preparation, the following special objects: To modernize the subject, correct certain traditional beliefs, advocate the earliest possible treatment, emphasize the importance of thorough examinations and definite diagnoses, and, to thoroughly illustrate the text. All worthy objects but not all attained in even a satisfactory degree. In the least important ones they did fairly well. In the matter of illustrations they succeeded admirably; indeed, I think it is the best illustrated text-book on otology that has ever been published. The specimens and preparations have been well selected, the drawings were well conceived and beautifully executed, and their reproduction is fine.

In the matter of modernizing the subject of otology, however, I fear they have failed. In the first place it is a pity that they not only have adhered to but exaggerated the old plan of chapter divisions. For instance, chronic purulent otitis media, though only covering 43 pages, is divided into three chapters; the intracranial complications of this disease occupies seven chapters, though it is all expressed within 60 pages; chronic non-suppurative otitis media requires three chapters. Add to this faulty subdivision of topics the fact that they have not maintained a proper sequence in treating of the suppurative and non-suppurative diseases, and one sees that they have converted what should be a simple, connected story into one that is broken, complicated,

and difficult to understand. If modern pathology has taught the otologist anything it is that acute tubo-tympanal catarrh, acute catarrhal otitis media, and chronic catarrhal otitis media are not different diseases but, merely, varying degrees or stages of the same affection. The same is true of the purulent affections of the tympanic cavity and mastoid cells.

In the modern text-book on any medical branch pathology should be the strong point. In this book the pathology is lamentably weak.

The strongest point in the work seems to me to be the attention paid to all the little details of clinical study and care of cases. In this respect alone the book is worth its price to the ear specialist. It represents the individual experience of the writers to a large degree, which gives it a peculiar value, and the beginner in otologic work will be perfectly safe in following the recommendations. I would not agree with the writers regarding the value of all their methods of treatment, perhaps, but will at least admit that our different points of view are debatable. Dr. Barnhill has not been so liberal. His condemnation of the blood-clot dressing in the mastoid operation is most unfair. In a brief foot-note he mentions that Blake, Reik, and Sprague advocate the method, expresses his feeling that the mastoid wound cannot be rendered sterile, and, quotes Dr. Jack to show that the method will usually fail or at best succeeds in only four out of 60 cases (6⅔%). Now the fact that he mentions the advocacy of the three first-named aurists in connection with Jack's paper shows that he must have been familiar with the statistics of Reik and Sprague, as well as those of Jack, for they were published in the same volume of Transactions of the American Otological Society, on consecutive pages, and all were discussed together. He employs the figures that condemn the method and ignores those of other workers which show from 50% to 75% of successes. I do not object to his attitude of disbelief in the dressing. He is at perfect liberty to adhere to the old method, even to bring forth any argument he can to prove that it is unworthy of trial, but, we ask for a fair and square presentation of all the facts in hand. H. O. R.

Milk and its Relation to the Public Health. By various authors. Hygienic Laboratory Bulletin No. 41. Treasury Department: Public Health and Marine Hospital Service of the United States. (*Washington: Government Printing Office, 1908.*)

This most important bulletin should reach every board of health in the United States; and much of the information contained in it would be of great value to the public, if this body could be reached in some effective manner. It will be only through the education of the people, and through their resulting forceful demands that our cities will receive little by little pure supplies of milk, and that the needless death and illness of numberless infants will be prevented. Could mothers see for themselves, and learn of the filthy conditions which prevail far and wide in our sources of milk supply, it would not be long before a distinctly improved condition in this matter resulted. There is no other food used by man which he takes with so little consideration as to its purity, and which is commonly so foul and disgusting. It is impossible to speak too strongly on this point. The government at Washington would have accomplished an end of far greater value if it had directed its attention and energies to "purity of milk," rather than to purity of other foods, whose impurities probably cause but infinitesimal suffering and a minimal proportion of deaths to that caused by milk. The "pure-food" law is admirable in many respects, but its value as regards national health and welfare is not to be measured in comparison to the beneficial effects to be reached from a "pure-milk" supply. It is therefore most fortunate that the Public Health and Marine Hospital Service of the United States should have issued this comprehensive volume which treats of milk in its relation to public health in a masterly manner. Here the subject is divided into twenty-two headings, and the bulletin begins with a discussion of milk as a cause of epidemics; after reading this chapter no one can longer doubt the immense rôle that this food plays in the spread of typhoid fever, scarlet fever, and diphtheria. The accompanying charts are most instructive. Other chapters of interest are those of "the frequency of tubercle bacilli in the market-milk of Washington, D. C.; morbidity and mortality statistics as influenced by milk; ice-cream; the chemistry of milk; diseases of the cow which injuriously affect the milk; and sanitary inspection of farms, and sanitary water supplies for the dairies." It is the publication of just such a report as this one which makes the existence of this service of the Treasury Department of such vital importance to the nation, and which does great credit to the authors of the various papers. It is to be hoped that the service will soon be separated from the Treasury Department, and that we shall have a "Secretary of Public Health." R. N.

Progressive Medicine. Edited by Hobart Amory Hare, M. D., etc., assisted by H. R. M. Landis, M. D., etc. Vol. I, March, 1908. Surgery of the Head, Neck, and Thorax; Infectious Diseases, including Acute Rheumatism and Croupous Pneumonia; The Diseases of Children; Rhinology and Laryngology; Otology. (*Philadelphia and New York: Lea & Febiger, 1908.*)

The quarterly publication of this work makes it only necessary to note the regular appearance of the volumes with their contents. They are not fitted to reviews, as they are themselves but condensed reviews of the literature of the past few months on the subjects treated. Both contributors and editors appear to labor conscientiously at their rather thankless and wearisome task of compilation, but their results are doubtless useful to many busy practitioners, who must be silently grateful for these volumes. R. N.

Bulletin of the Toronto Hospital for the Insane. A journal devoted to the interests of Psychiatry in Ontario. Printed by order of the Legislative Assembly, January, 1908. (*Toronto: Warwick Brothers & Rutter, Limited, 1908.*)

This bulletin is mainly filled with an account of the psychiatric clinics of Germany from the pen of Dr. C. K. Clarke, who lately visited them as a representative of the Province of Ontario. He visited several of the German psychiatric clinics and gives an interesting résumé of the advantages and disadvantages of the principal ones, Berlin, Munich, Tübingen, and Giessen. The author gives the preference to the clinic at Munich, both as regards the arrangement of the buildings and the methods of treatment employed there. We would commend this paper to the careful consideration of all who are engaged in the hospital treatment of the insane. It is most valuable and suggestive.

Light and X-Ray Treatment of Skin Diseases. By Malcolm Morris, F. R. C. S., and S. Ernest Dore, M. D. Price $1.50. (*Chicago: W. T. Keener & Co., 1907.*)

Morris and Dore have not intended their book to be an exhaustive study on light treatment. It is more a monograph and gives largely their experiences and cases treated in this line of work. On reading the book one cannot but be impressed by the sane and conservative way in which the authors treat the subject. There can be no doubt that they are convinced that the light treatment in skin diseases, especially lupus, is far superior to other forms of treatment, yet they frankly point out its limitations and confess that a certain percentage of cases do not yield at all.

So much has been claimed for light treatment and constantly we see in our medical journals impossible cures made by the

X-ray, Finsen, or radium treatment that it is a relief to find a monograph which gives an honest view of the subject. The authors have given us a concise summary of the methods of application and the results of the Finsen light treatment, X-ray, and radium. Their hospital connections have given them a large amount of material and so they are in a position to speak authoritatively on the subject.

Outlines of Psychiatry. Nervous and Mental Disease Monograph Series No. 1. By WILLIAM A. WHITE, M. D., Superintendent Government Hospital for the Insane, Washington, D. C., etc. (*New York: The Journal of Nervous and Mental Disease Publishing Company, 1907.*)

This work gives an excellent outline of modern psychiatry and is worthy the attention of all students of mental medicine. The author does not consider insanity a single disease but rather a series of disorders of some or all of the mental processes. His definition of insanity is a time-honored one and probably as serviceable as any which can be given to the student. "Insanity is a disorder of the mind due to disease of the brain manifesting itself by a more or less prolonged departure from the individual's usual manner of thinking, feeling, and acting, and resulting in a lessened capacity for adaptation to the environment."

The chapters on classification and causation contain nothing especially new or interesting and do not require special consideration. A general chapter on treatment follows, although specific directions for the treatment of the various forms of insanity are also given in subsequent chapters. We notice that he prefers the œsophageal to the nasal route in feeding contrary to the experience of many. The section also on medication is open to the objection that it seems to give too much countenance to the administration of hypnotics and the hypodermic use of the alkaloids of hyoscyamus. The general practitioner is too much inclined to rely upon these remedies and does not generally, like the author, defer their use "until other means have failed." The author's description of the general symptomatology of insanity is excellent and his definitions of terms like illusions, hallucinations, clouding of consciousness, dream states, stereotypy, negativism, disorders of personality, etc., are very clear and well-expressed. The chapter upon the examination of the insane is one of the most complete in the whole book. It is so full in fact that one almost questions the possibility of making practical use of it in a large institution with many admissions. Some of the tests proposed seem better adapted to normal rather than abnormal psychology. The chapter on Paranoia and Paranoid States is carefully and discriminatingly written and deserves attention. We have rarely seen a more satisfactory exposition of these much-controverted topics. The same is true also of the chapters entitled Manic Depressive Psychoses, Dementia Precox, The Infection and Exhaustion Psychoses, and the Toxic Psychoses. We notice in the latter that the author recommends the gradual withdrawal of morphia from the morphia habitué. This seems wise only where there is great physical debility. In many cases the peremptory withdrawal of the drug contributes to the permanency of the recovery by showing the habitué that he suffers much less than he expected and gives him confidence in his own strength of will. The book is so well done it deserves to be introduced into medical schools and training schools for nurses. We shall hope to see a more elaborate work on insanity from the author.

BOOKS RECEIVED.

The Animal Mind. A Text-book of Comparative Psychology. By Margaret Floy Washburn, Ph. D. The Animal Behavior Series. Volume II. 1908. 12mo. 333 pages. The Macmillan Company, New York.

Hematological Atlas, with a Description of the Technic of Blood Examination. By Priv. Doz. Karl Schleip. English Adaptation of Text by Frederic E. Sondern, M. D. With 71 colored illustrations. [1908.] 4to. 256 pages. Rebman Company, New York.

Progressive Medicine. A Quarterly Digest of Advances, Discoveries, and Improvements in the Medical and Surgical Sciences. Edited by Hobart Amory Hare, M. D., assisted by H. R. M. Landis, M. D. Volume I. March, 1908. 8vo. 284 pages. Lea and Febiger, Philadelphia and New York.

Rotunda Midwifery for Nurses and Midwives. By G. T. Wrench, M. D. With Introduction by the Master of the Rotunda Hospital. 1908. 12mo. 324 pages. Henry Frowde, London; Hodder and Stoughton, London. *Oxford Medical Publications.*

Scientific Memoirs (New Series), No. 29 and 30. By Officers of the Medical and Sanitary Departments of the Government of India.

Piroplasma Canis and its Life Cycle in the Tick. By Captain S. R. Christophers, M. B., I. M. S. 1907. Fol. 83 pages. Office of the Superintendent of Government Printing, Calcutta, India.

The Theory and Practice of Anti-Rabic Immunization. By Captain W. F. Harvey, M. B., I. M. S., and Captain Anderson McKendrick, M. B., I. M. S. 1907. Fol. 43 pages. Superintendent of Government Printing, Calcutta, India.

Treatment of Internal Diseases. By Dr. Norbert Ortner. Edited by Nathaniel Bowditch Potter, M. D. Translated by Frederic H. Bartlett, M. D. From the fourth German edition. [1908.] 8vo. 658 pages. J. B. Lippincott Company, Philadelphia and London.

Life Insurance and General Practice. By E. M. Brockbank, M. D. (Vict.), F. R. C. P. 1908. 12mo. 288 pages. Henry Frowde, London; Hodder and Stoughton, London. *Oxford Medical Publications.*

Medical Lectures and Aphorisms. By Samuel Gee, M. D. 1908. 12 mo. 288 pages. Henry Frowde, London; Hodder and Stoughton, London. *Oxford Medical Publications.*

Clinical Lectures and Addresses on Surgery. By C. B. Lockwood. 1907. 12mo. 307 pages. Henry Frowde, London; Hodder and Stoughton, London. *Oxford Medical Publications.*

Manual of Surgery. By Alexis Thomson, F. R. C. S. Ed., and Alexander Miles, F. R. C. S. Ed. Second edition, revised and enlarged. With 516 illustrations, mostly wood engravings. Volume first, General Surgery. Volume second, Regional Surgery. 12mo. [1906.] J. B. Lippincott Company, Philadelphia and London.

Saint Bartholomew's Hospital Reports. Edited by H. Morley Fletcher, M. D., and W. McAdam Eccles, M. S., F. R. C. S. Volume XLIII, 1907. 8vo. 439 pages. 1908. Smith, Elder, and Company, London.

A Practical Guide to the Examination of the Ear. By Selden Spencer, A. B., M. D. With an Introductory Chapter by H. N. Spencer, M. D., LL. D. 1908. 12mo. 66 pages. C. V. Mosby, Medical Book Publishing Company, St. Louis.

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CONTENTS.

	PAGE
Avicenna and Arabian Medicine. (Illustrated.) By J. A. Chatard, M. D.	157
The Kern-Plasma Relation Theory. By William Travis Howard, M. D.	161
Fritz Schaudinn: A Review of His Work. By Oscar T. Schultz, M. D.	169
The Methods of the Henry Phipps Institute for the Study, Treatment, and Prevention of Tuberculosis in Philadelphia. By Joseph Walsh, M. D.	173
Proceedings of Societies. The Johns Hopkins Medical Society. A Case of Gas-cyst of the Intestine [Dr. Finney];—Splenectomy, with a Report of Six Cases [Dr. George Ben Johnston];—The Kern-plasma Relation Theory [Dr. Howard];—Studies on the Circulation [Dr. P. M. Dawson, Dr. R. P. Higgins and Mr. L. W. Gorham].	177
Notes on New Books.	180
Books Received.	185

AVICENNA AND ARABIAN MEDICINE.

By J. A. Chatard, M. D.,

Instructor in Medicine, Johns Hopkins University.

In considering the life of Avicenna, who has been quite worthily given the Arabian title of "the Prince of Physicians" (el Sheik el Reis), it would certainly not be amiss to enter a little upon the interesting history of that period, and so place ourselves thoroughly in the times when Avicenna lived and taught.

The Arabic period in medicine may be embraced between the years 640 to 1400 A. D.; for about a century previous to the beginning of this, medical science had been slowly degenerating from the wonderful times of Galen and the other celebrated Greek physicians. The nations of the earth were much upset by war and internal troubles, the Roman Empire had been gradually decaying, so with the impetus following the foundation of the strong Eastern Empire under the famous Haroun al Rashid, the Arabians, as well as the Persians, Syrians, Christians and Jews all took prominent parts in an active regeneration of the arts and sciences. The great interest, firm support, protection, fostering care and enrichment, given by the Moslem rulers to either foreign or domestic celebrities, contributed greatly to this advancement.

Many Grecian and other nationalities flocked to the Eastern cities, or to Spain, where the Moors were already shedding light on the learning of the West. The great universities, at Bagdad, Bokhara, Damascus, Alexandria, and other places were founded, and the annual budget allowed to the many universities during some years amounted to over fifty millions of dollars, a very large sum for that period. At Bagdad there were often 6000 teachers and students from all parts of the world. In Spain the cities of Cordova, Toledo, Seville and Murcia possessed great public libraries and academies; the famous university of Cordova in the tenth century having a library of about 250,000 volumes.

The Arabic education of the time was not at all limited, but embraced most of the faculties, so that physicians were often mathematicians, deep philosophers, jurists, theologians and natural scientists. The close intercourse in commerce with the Greeians and the presence of many of their doctors among the early Arabians, paved the way for the foundation of Greco-Arabian medicine, based on the principles and theories of Hippocrates, but especially of Galen: these, however, were not the only influences, as Indian medical views as well as those of the earlier Asiatic people and Egyptians, together with some astrology and alchemy, all entered into the make-up of Arabian medical thought.

As a rule the medical branches were subsidiary to the study of theology, philosophy, mathematics, physics, astronomy, and were not taught separately: "Practical anatomy was excluded utterly by religious belief, and midwifery and gynæcology were then (as almost universally in the East to-day) forbidden to men. The practice of operative surgery, too, was

considered unworthy of a man of honor, and was permitted only to the despised lithotomists and persons of the lower class. Operations performed by the hands, such as venesection, cauterizations and incision of arteries were suitable for physicians' assistants only."

Personal observation was little cultivated though there was some clinical instruction. Rhazes says "a thousand physicians for probably a thousand years have labored on the improvement of medicine; he who reads their writings with assiduity and reflection discovers in a short life more than if he should run after the sick a thousand years"; yet later he confesses very truly, "reading does not make the physician, but a critical judgment and the application of known truths to special cases."

Students after a medical course passed through special examinations before a board before getting their diplomas. The teachers as a rule were well paid, some receiving over 200 dollars a month; this was most important as the medical fees of those days were small, except among the most famous men. The following schedule of fees is rather interesting:

A. The poor must be treated gratuitously.

B. The physician must visit his patient at least twice each day, and if requested by the latter, once also at night. For this he received for every day of treatment:

(a) In the city or at his residence—half a tarenus=$0.14.

(b) Away from his residence, when

(1) The patient paid his travelling expenses—3 tareni = $0.85.

(2) The doctor paid his travelling expenses—4 tareni = $1.17.

The fee was usually stipulated in advance or during the course of the disease, as one writer says: "make it high (the fee) as, after recovery, recollection of the services rendered declines rapidly."

In the tenth century there were in Bagdad as many as 860 physicians, the compounding of whose remedies was most interesting, as almost universally in those days the doctrine of geometrical proportions and musical harmony were employed, thus:

Cardamon is	1°	warm	½°	cold	½°	moist	1°	dry.
Sugar "	2°	"	1°	"	1°	"	2°	"
Indigo "	½°	"	1°	"	½°	"	1°	"
Emblica "	1°	"	2°	"	1°	"	2°	"
Sum "	4½°	"	4½°	"	3°	"	6°	"

As the warm and the cold are equal and the dry twice as much as the moist, the above prescription gives us a compound dry in the first degree.

As regards the hospitals of those times, among the most famous was that at Cairo, as it had both male and female nurses, special wards for wounds, diseases of the eye, diarrhoeal diseases, and fevers (this ward being cooled by fountains), a ward for women, one for convalescents, and many other rooms.

Among the most noted of the Arabian physicians were Rhazes (850 to 923), famous for his Liber Continens, with its wonderful description of small-pox and measles. Ali Abbas, who flourished about the same time, and said so aptly that "the physician should control the accuracy of the pictures of disease found in books, by his own careful bedside observations." Albucases (936 to 1013), a Spanish Arabian physician; Avenzoar (1113 to 1162); and Averröes (1166 to 1198) his pupil, whose book we have here to-night written as a compendium of Avicenna's celebrated "Canticum."

The most famous of all these and one whose name and fame lived longer, was Avicenna (the Latinized contraction of his Arabic name, Abû Ali el Hosein, Ibu-Abdallah Ibn-Sina), who was born A. D. 980 at Afschena, a hamlet in the district of Bokhara; his mother being a native of the place, but his father a Persian official, who was able to give him full freedom in his education. He showed such wonderful progress in his work that he is said to have mastered the whole Koran at the age of ten years. After studying various branches of the day, as grammar, dialectics, astronomy and geometry, he learned Indian figures from a travelling merchant, and soon mastered more than his teachers; he spent some time at Aristotelian philosophy, and finally studied medicine at Bagdad, where at the age of 16 he qualified to teach and practice medicine.

His first appointment was that of physician to the Emir, whom he cured of a serious sickness and was rewarded by access to the Royal Library, which he found of great help. Among his earliest works was the Collectio, or a short synopsis of general knowledge. Having lost his father at the age of 22 Avicenna began some years of wandering about the various towns, living under the patronage of the different Emirs, practicing his art, working on his various books, and beginning his famous "Canon." Finally he settled at Hamadâu, where for medical services to the Emir he was made Vizier. Later, however, he was banished, but restored again to power, after a period of seclusion, which was a most profitable time for his writings and studies.

During the last ten years of his life he lived at Ispahan, continuing his work but at the same time leading a life of great excesses. Gradually his once robust constitution was so undermined that he was seized with his fatal illness (a colic) while on the way to Hamadâu with the Emir's army. Finding the disease gaining ground he resigned himself to death, and in his remorse, freed his slaves, gave his wealth to the poor, and listened to the reading of the Koran. He died in June, A. D. 1037, in his 58th year, and was buried at Hamadâu, where, according to M. Schlimmer (Leclere Vol. I.) the tomb still exists, but has fallen to ruins.

Among the most important works of Avicenna is the Canon, an early edition of which was published in Padua in 1476, but the most complete one in Rome in 1593, this latter in Arabic. Many other editions followed even as late as 1658. This famous work was the text-book for most of the nations for many centuries, and in fact up to 1650 it was still used in the universities of Louvain and Montpellier. This may be noted in the following schedule of studies from the medical curriculum of the University of Leipsic, about the fifteenth century, according to Haeser (Baas).

Hour.	1st Year.	2d Year.	3d Year.
6–7 a. m.	1st Canon of Avicenna with explanation of Jacob of Forti.	The "Ars Parva" of Galen with the exposition of Torrigiano.	The Aphorisms of Hippocrates with the commentaries of Galen and Jacobus.
1 p. m.	Book No. 9 of Rhazes with the exposition of Arculanus.	1st fen. 4th book of the Canon of Avicenna.	4th fen. 1st book of the Canon of Avicenna with the commentaries of Dinus de Garbo, or Hygo.
3 p. m.	The "Doctores" read some work aloud in the semester, as the "Prognosticon of Hippocrates."		

The Canon was divided into five parts: science in general, materia medica, special diseases, common diseases of the different regions and organs, and lastly a general pharmacopeia. We may in looking more thoroughly into this work be struck not only with the wide range of the work, but the practical importance of many of the things found therein, and their application to modern ideas. In etiology and pathogenesis of disease air and water are considered to be important factors; he says "the body to be in a healthy state must have the heart warm, the brain moist, the nerves cold, and the bones dry." He speaks of the predisposition to disease in certain individuals. In the description of a disease of the bone "Spina Ventosa" he notes that it is due to the acrid humor of the bones, but later has a remarkable statement that the "bone may be eaten away by some small animalculus, which enters through a wound and destroys the bone," though he says "this observation is not confirmed" (this might be quite applicable to the modern microbic theory of disease).

Under diagnosis and symptomatology his description of small-pox is quite clear and explicit, a careful description of the rash, whether discrete or confluent being given. Under measles he notes that when the color of the rash is red it is not nearly so fatal as when black (hæmorrhagic form). The fevers are considered under the general heading "epidemic fevers," and their general aspect is well described, especially as regards the appearance of the patient, the pulse, the urine, and the stools. He gives prominent place to mental diseases, describes tetanus, rabies, both in animals and man; three forms of chest inflammation, and also muscular rheumatism. According to Lichtenstein, he is said to be the first physician to teach the contagiousness of phthisis. He distinguishes fifteen kinds of pain, assumes the four peripathetico-scholastic causes of diseases (material, efficient, formal, and final causes), and preserves the Galenical, humoral pathology.

Under the heading of "Prognostics" Avicenna gives a great number of signs and symptoms indicating a favorable termination or not, which resemble somewhat the Hippocratic writings. The following may be quoted:

"The involuntary flowing of tears, especially when from one eye only is a bad sign."

"The eyes remaining open as in a state of watchfulness, even when the finger approaches them, is a sign of death."

"The running of a yellow fluid from the nose in acute fevers is probably a bad sign, and announces the approach of death."

"The deviation of the lips in grave fevers is a bad sign."

"The rejection of water through the nose is a bad sign."

"If the sick one lies upon his stomach contrary to his usual custom it is a bad sign."

"The swelling of the abdomen in acute diseases with diarrhœa, is a sign of death especially if there appear livid spots."

"Extreme pain in the abdomen with intense fever is serious."

"If you see the sick one make movements with his hands, as if picking things off himself, it is a sign of death."

"If the pain over any organ ceases suddenly without any cause, this disappearance is to be feared."

"The excessive talking of one usually silent indicates the beginning of delirium."

"If the sick one has an exaggerated fear of death it is a bad sign."

"The loss of appetite in chronic diseases, and if thirst ceases in intense fevers; these are very bad signs, especially if the tongue is black."

A large part of the Canon is devoted to the various kinds and forms of treatment of diseases, together with descriptions of the different drugs and compounds so common in those times. The life and habits of the people are considered care-

fully; how the houses should be placed, the water supply and ventilation; the action and uses of exercise and massage are spoken of and the latter is said to be of great use when used judiciously.

Under "Hydrotherapy" hot and cold baths are discussed, and the times for their use noted. Mineral waters are of great use, and certain points as the following may be quoted:

"Sulphur water is good for leprosy, for inflammation of the joints and against the itch."

"Waters charged with alum are good for bloody sputum."

"Sulphur waters are good for disorders of the spleen and liver, and for the pains that accompany it."

"Iron waters are also good for the spleen and stomach."

"Saline waters produce diarrhœa first; then constipation follows."

"All mineral waters render micturition, menstruation and labor difficult."

"In case of snake bite sea water baths are useful."

In the treatment of epidemic fevers Avicenna advocates rest and purgation first, thus seeking to drive out the cause of the disease; bleeding may also be resorted to. He gives his patients pastilles of camphor and cooling syrups, their food and drink should be acidulated with a little sour milk or vinegar. Cold water in large quantities is most useful and profitable. For the bites of mad dogs he advises the use of the cautery or bleeding, saying "all bites are less dangerous the more blood has been lost." As regards drugs he mentions camphor, amber, cubebs, and is especially noted for the introduction of some of the purgatives; manna, senna, rhubarb, tamarind and cassia: also for musk, nutmeg and cloves. Iron in its various forms he used, and considered gold and silver as blood purifiers, hence gilded or silver pills are most effective. He recommends bleeding at the outset of disease, at a point remote from the seat of the disease; but at the end of the illness at a point contiguous to the seat of the disease. In diarrhœa he gave gentle laxatives. In great coldness or in great heat he gave no medicine; considers the same medicine good in one locality, which would be injurious if employed in another.

In surgery he calls the extraction of a cataract a dangerous operation; declines to operate on strangulated hernias, and describes puncture of the bladder. He loosens teeth by means of the fat of tree toads in preference to pulling them. In obstetrics he follows the older writers, and in military surgery the methods of Galen. Baas says "his views (Avicenna) as to what is allowable to a physician are characteristic of Arabian thought and ideas; as a priest he could never employ reason; as a philosopher, however, he could, when, e. g., it is asserted that jaundice is removed on looking at yellow objects, he will not as a physician question the facts, but as a philosopher he cautions against superstitious remedies."

Next to the Canon his most important medical work is an abridgement of medicine in verse called the Canticum (this is the book we have before us to-night, with commentaries on it by Averröes, which was published in 1484 in Venice). Other medical works by Avicenna were those on the Pulse, A Compendium of Medicine, on Theory, Principles of Therapeutics, and on Colic. Besides these he wrote many important philosophical treatises and works. It is most interesting that Avicenna, who was such an authority among both Arabians and Christians, and whose works had so many commentaries by many writers, was himself mainly a commentator and compiler.

According to Baas

Arabian medicine, entirely independent of its introduction into nosology of a few new and important diseases, rendered itself of essential service to medicine in the following directions:

I. "It cultivated the study of the Greeks, and made them accessible to the West until through the revival of learning, the Greek writers could once more be studied in the original. This transfer of Grecian science including medicine, to the West, was accomplished through Italy and Spain, and even as early as the age of Charlemagne, though it became more marked in the following centuries. By it the Arabians acquired very high importance in the intellectual development of the West, and particularly in its medical culture. Hence the popular scorn of the Arabians, manifested by those who proclaim only 'new facts as acquisitions in medicine,' seems entirely out of place. Indirectly Arabian civilization and culture was of further advantage in that it awakened by its own too servile imitation an opposition against its teachers and even against itself."

II. "It introduced a great number of new and active remedies in the vegetable kingdom, especially from the department of chemistry (a science which it fairly created) and brought to life the pharmacies as an advance in practice."

III. "It contributed directly to the reform of practical medicine by the exhibition of chemical remedies: indirectly by the union of the natural sciences with medicine, which (on the advice of Aristotle) had its origin with them."

IV. "It first entered upon the clinical method of instruction, though it reaped very little advantage therefrom."

V. "It preserved a lay medicine at a time when, as in the West, priests and monks only, in Christian ignorance, treated the sick with superstitious remedies; a period which without the Arabians would have lasted longer than it actually did."

Such are the services which secured to the Arabians for all times an honorable position in the history of medical culture, starting as it did "in the sterile wastes of the desert, here the Arabians construeted a verdant oasis of science, in lands, today once more the home of absolute or partial barbarism. A genuine meteor of civilization were these Arabians, a meteor which arose from the long darkened Orient, and in its course towards the West, lightened the whole Occident before its final extinction."

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THE KERN-PLASMA RELATION THEORY.[1]

By William Travis Howard, M. D.,
Professor of Pathology, Western Reserve University, Cleveland, Ohio.

When invited to address you on some aspect of the newer cytology, I chose the kern-plasma relation theory, because it treats of the branch of the subject with which I happen to be most familiar, and for the additional reason that it seems to me to be the one which must exert a most important influence upon our knowledge of the physiology and pathology of the cell.

It will serve to emphasize, also, two facts which we are apt to forget, namely, that pathology is physiology under altered environments and that both physiology and pathology are but branches of General Biology.

Intimately associated with and supplementing the kern-plasma relation theory are Schaudinn's doctrine of nuclear duality (the separation of nuclear material into germinative and somatic nuclear substances) and Goldschmidt's doctrine of the chromidial apparatus. In the following pages I shall quote freely from the writings and teachings of Richard Hertwig, Schaudinn and Richard Goldschmidt, to whom I wish to make due acknowledgment.

The kern-plasma relation theory and the chromidial apparatus theory, which are two of the most important and productive theories of modern zoology, are both products of the Munich Zoological Institute.

It was observed, long since, that cells with a large amount of protoplasm have larger nuclei than those poorer in protoplasm, and further, that certain active cells, such as germinative and secreting cells, have larger nuclei than relatively inactive cells, such as epidermal cells and connective tissue corpuscles.

It remained, however, for Hertwig to investigate these phenomena experimentally and to call attention to the fact that the proportion of the nuclear material to the protoplasm of a cell may not rise or fall beyond certain limits without serious consequences, which are both complex and varied.

As the result of his studies, Hertwig (1903) formulated his kern-plasma relation theory, according to which, "for each cell there exists a definite size relation of nuclear mass to cell mass which may be represented by the formula K/P." According to his view, variations in the kern-plasma relation depend especially upon the assimilation capacity of the cell and upon cell division; hence, functional and divisional growth of the nucleus may be distinguished. His studies on protozoa have convinced him that the kern-plasma relation underlies not only periodic modifications brought about by the ordinary processes of life, but that it may experience more lasting changes under three influences; namely, uninterrupted function, starvation and change of temperature.

Before considering the experimental and other evidence which Hertwig and his pupils have brought forward in support of this theory, it is necessary to review briefly Hertwig's conception of the organization of the nucleus and its relation to the protoplasm.

The basis of the nucleus is the achromatic material arranged, like that of the protoplasm, in the form of a meshwork, in the spaces of which is the nuclear sap. The two important nuclear substances in both protozoan and metazoan cells are the nucleolar substance and the chromatin. The nucleolar substance, which is identical with the plastin of other writers, forms the substratum to which the chromatin is bound and by which it is organized. The chromatin may be uniformly distributed over the nucleolar substance or in thickened masses at various points. In some nuclei there is an excess of nucleolar substance uncombined with chromatin, forming the true nucleoli or plasmosomes of certain protozoan and metazoan cells which are typified especially by the nucleoli of secreting cells. The so-called nucleoli of ganglion cells, then, are not true nucleoli but amphinucleoli (or according to the usual terminology, karyosomes). The true nucleolus or plasmosome does not stain with chromatin-staining dyes and contains no visible chromatin.

There is constant interchange between nucleus and protoplasm. The latter possesses the property of splitting up materials which are taken up and used by the nucleus, while the nucleus continually gives off substances to the protoplasm. As long as the balance of the interchange is in favor of the nucleus, its integrity is assured. That nucleolar substance, both alone and united with chromatin, leaves the nucleus and establishes itself in the protoplasm under a variety of conditions and under various influences is now a well attested fact. To these bodies derived from the nucleus and lying in the protoplasm of various cells a number of names have been given and various functions assigned. As will be shown later, these masses of extranuclear nucleolar substance and chromatin are often concerned actively in the functions of the cell and are, therefore, a part of the nuclear apparatus (chromidial apparatus of Goldschmidt), and sometimes they represent nuclear material in the process of disintegration and extrusion. In either case they play an important part in the kern-plasma relation. These masses of nuclear material (nucleolar substance and chromatin) lying in the protoplasm have been called chromidia and chromidialnetz by Hertwig and chromidial apparatus by Goldschmidt. We must trace the development of our knowledge of these structures before treating of the variations of the kern-plasma relation.

Chromidialnetz.—In 1899, Hertwig described in the protoplasm of the shelled rhizopod *Arcella vulgaris* a net-work of chromatin-staining material situated chiefly at the periphery of the cell. Arcella has usually two nuclei, each containing a central amphinucleolus or karyosome. The protoplasmic chromatic meshwork of Arcella is connected with the nuclei and

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has the staining reactions of the amphinucleus. Hertwig called this structure chromidialnetz. It has all the properties of active nuclear material and may organize itself into definite morphological nuclei. Similar structures have been found by Hertwig in mononuclear Monothalmia.

In the light of Bütschli's work on bacteria and cyanophyceæ Hertwig (1902) is of the opinion that in these organisms the nucleus is lacking as a definite cell organ, but that their protoplasm is beset with a chromidial-net. When the latter is equally distributed throughout the cell, no true cortical layer is visible (a similar condition occurs in encysting *Arcella vulgaris*), but when the chromidial-net is retracted the protoplasm comes into view.

Schaudinn (1902 and 1903), in his remarkable work on *B. bütschlii* and *B. sporonema,* has described the protoplasm of these organisms as having an alveolar meshwork, on the nodal points of which there are granules with the staining reactions of chromatin, the whole having the appearance of a chromidial-net. In both of these bacilli, this scattered chromatin-staining material is gathered before division and spore formation into one or more morphological nuclei. No doubt the remarkable variations in the distribution of the chromatin in *B. diphtheriae* and similar bacilli will occur to you in this connection.

Chromidia.—In another type of rhizopod, the heliozoan *Actinosphærium eichorni,* a multinucleated organism with numerous pseudopodia and a widely meshed protoplasm, Hertwig (1902) has described the presence of larger and smaller masses of chromatic material in the protoplasm. These masses, consisting of nucleolar substance combined with chromatin and having all the reactions of the amphinucleus, he called chromidia. He traced the origin of these chromidia to the nuclei.

Chromidia may be present in small numbers in normal Actinosphæria and are greatly increased by overfeeding and hunger. Chromidia have been described in various other rhizopods by Schaudinn and by Calkins and in certain gregarines by Léger, Schellach, Kutschakewitsch and others.

Under certain circumstances all of the nuclei of some protozoa, of which Actinosphærium and certain gregarines are examples, may be dissolved and all the nuclear material may be represented by chromidia.

Chromidial apparatus.—Goldschmidt (1904, a and b) has called attention to the important rôle played by chromidia in protozoa, in egg and in various other metazoan cells. He groups as chromidial apparatus not only the chromidial-net and the chromidia of Hertwig, but the nebenkerne, pseudochromosomes, mitochondria, ergastoplasma, trophospongia and apparato reticulare, etc., described by various authors in metazoan cells, and emphasizes their importance in the function of the cell. He worked especially with *Ascaris lumbricoides* and showed that in this animal with huge cells, in addition to the chromatin of the relatively small nuclei, the protoplasm of many cells is beset with larger and smaller strands and irregular masses of chromatin-staining material, which are most abundant about the nuclei and which evidently pass out from the latter. These chromidia are most abundant in Ascaris in epithelial-muscle cells, intestinal cells and body muscle cells; they are also present in certain nerve cells. Goldschmidt regards these chromidia as necessary for the active function of the cells and proved by experiment that they are increased in number and size by increased function.

The development of our knowledge of these variously named chromatin-staining structures in the protoplasm of metazoan cells forms one of the most interesting chapters in modern cytology. As early as 1880, Gaule described chromatin-staining fibrils in the blood corpuscles, pancreas and liver cells of frogs. He called them at first cytozoen, but later identified them with nebenkerne, a name given by Nussbaum (1877-79) to fibrillar structures found by him in pancreas cells of amphibians and corresponding to similar structures found in spermatids and the dotterkerne of eggs.

These nebenkerne have been regarded as nuclear derivatives and important in cell activity by Ogata (1883), Eberth and Müller (1892), Mathews (1899), Montgomery and others. Perhaps the most interesting and comprehensive work of the earlier authors on the extranuclear chromatin-staining material of secreting cells is that of Mathews, who described them in liver and pancreas cells as staining like chromatin, consisting apparently of nucleo-albumin, and derived directly from the nuclear chromatin. They disappear with the elaboration of secretion material and the zymogen granules are formed directly from them.

As mitochondria, Benda described certain granular bodies present near the nuclei in the protoplasm of sperm cells, egg cells and certain epithelia. The pseudochromosomes, central capsules and archo-plasma fibres of Hermann have been grouped by M. Heidenhaim with the mitochromidia. Holmgren (1899 and 1900) has described as trophospongia certain structures which he looked upon as canals in ganglion, pancreas, intestinal epithelium and other cells. Many of these structures described by Holmgren are probably chromidia, though the existence of canals in ganglion cells can not be denied. The apparato reticulare found by Golgi in ganglion cells impregnated with chrome silver is a zonular meshwork of fibrils about the nuclei. Similar structures have been found in cartilage and in various gland cells, and have been identified by certain observers with mitochondria.

Garnier (1897) and Bouin (1898) are responsible for the ergastoplasma doctrine, the essence of which is that there exists a cytoplasm of higher value or power than ordinary cytoplasm; it is supposed to consist of cytochromatin derived from the nucleus. Various authors have assigned to this "superior protoplasm" an important rôle in secreting, muscle, ganglion and germ cells.

Popoff (1907, a), in his work on the sex cells of *Paludina vivipara,* has described chromidia in larger and smaller numbers in the various stages of development of egg and sperm cells and has traced their origin from the nucleus.

Goldschmidt and Popoff (1907, b) have drawn attention to the fact that in both protozoa (Euglina, various amœbæ, Actinosphærium, etc.) and in metazoan sex cells (Paludina, Helix,

etc.) during division, chromidia are thrown from the nucleus. For them, this is connected with the nuclear dualism of cells, which will be discussed later.

That certain bacterial cells have a chromidial apparatus is supported by Hertwig's interpretation of Bütschli's observations and by Schaudinn's work on *B. bütschlii* and *B. sporonema.*

From the foregoing, it is evident that one must recognize under the term nucleus, both intra- and extra-nuclear functioning nuclear material, to which the term nuclear apparatus applies; and that the extra-nuclear material—the chromidial apparatus—is often of great importance to the cell.

NON-DIVISIONAL INCREASE OF NUCLEAR MATERIAL AND ITS CONSEQUENCES.

As previously stated, Hertwig (1903 and 1904) has shown that the kern-plasma relation is disturbed not only just before division, but especially in protozoa and egg cells by (1) overfeeding (increased function), (2) hunger and (3) cold.

(1) By continuous overfeeding of protozoa the increased functional activity of the cells leads to a marked increase of the nuclear material at the expense of the protoplasm. Under these conditions the animals increase both in size and number for a certain period, when they become "depressed," and then recover and feed and multiply for a time, and, then, again suffer a period of "depression."

During the periods of multiplication, the amount of nuclear material is enormously increased and this reaches its highest point when "depression" ensues. The animals become depressed because the balance between nucleus and protoplasm is upset and the power of the cells to regulate this balance is lost. During the periods of depression the cells reconstruct themselves, sometimes by throwing off and destroying nuclear material and sometimes by conjugation.

These facts have been established by Hertwig and his pupils by experiments on *Actinosphærium eichorni, Dileptus gigas, Paramœcium caudatum* and *Frontonia.* For the latter two organisms accurate measurements of the size of the nucleus and protoplasm have been made (Popoff, 1907, b).

Popoff (1907, b) has shown that in Paramœcium the conjugation epidemics occur during the stage of depression. He overfed a culture of Paramœcium from April 1 until July 16, when the culture died out. He traced the curve of depression and multiplication and found that the greatest disturbance in the kern-plasma relation occurred in depression, when the macronuclei were greatly increased in size, and threw off larger and smaller portions of nuclear material into the protoplasm, which showed actual shrinkage—from 320-360 micra extreme normal to 200-90 micra. Nuclear material separated off from the macronuclei and disappeared. During the depression periods the micronuclei divide and, instead of the normal number, two, there may be as many as eight. This is to be regarded as an evidence of preparation for conjugation.

Hertwig's (1904) observations on the physiological degeneration of *Actinosphærium eichorni* furnish the first and most remarkable evidences of the results of hyperfunction of cells due to overfeeding.

He overfed cultures of *Actinosphærium eichorni* for months. There occurred periods of active growth and multiplication, alternating with intervals of arrest of these as well as of feeding. In the periods of depression, during which the animals lost the power to feed and to multiply, they often lost their pseudopodia and showed various other evidences of illness. Animals killed at various periods of the culture and stained showed marked changes in both nuclei and protoplasm. In this multinucleated organism, with a widely meshed protoplasm, the latter was often thickened and all distinction between the medulla and cortex disappeared. There was hypertrophy and hyperplasia, often associated with hyperchromatism, of the nuclei. The nuclei increased from the normal diameter of from 10 to 14 micra to 20 to 35 or even to 195 micra. The latter he calls giant nuclei and animals with giant nuclei always died; in these the kern-plasma relation is disturbed to a degree incompatible with life.

Hertwig has described in these animals depressed from prolonged overfeeding, besides the changes above mentioned, the outpouring of nucleolar substance and chromatin from the nuclei into the plasma (chromidiosis), the extrusion, the dissolution and the breaking down of the same into pigment, which is in turn extruded, the extrusion of nuclei, the necrosis and shrinkage of protoplasm, the degeneration, as well as various modifications in the size, number and structure of nuclei. Chromidia occur in small amount in normal Actinosphæria, but in these depressed animals they are very numerous and often in large, round, elongated or triangular masses, which are often vacuolated. The pigment is one of the products of the disintegration of these masses, and is thrown off from the surface of the organism. It is of a yellowish-brown color and, as Rössle has shown, it has the same micro-chemical characters as the iron-free pigment of certain metazoan cells. One of the forms of nuclear degeneration described by Hertwig is the vacuolization of nucleoli. Following the dissolution of the nuclear membrane, vacuolated nucleoli may be set free in the protoplasm, where they may assume bizarre shapes.

In the study of a series of Actinosphæria taken from Hertwig's overfed culture last winter and spring, in addition to confirming many of his observations, I (1908) was able to add three new points, namely, the occurrence of pigment granules in nuclei, hyaline degeneration of the nuclear reticulum leading to the formation of shrunken vacuolated nuclei, resembling in some respects the free vacuolated nucleoli of Hertwig (1904), and finally, that in animals with hypertrophied, hyperchromatic nuclei, reduction of the nuclear mass is accomplished mainly by extrusion of chromidia, while in animals with great numbers of relatively small nuclei this is effected chiefly by shrinking, vacuolization, hyaline degeneration and dissolution of nuclei.

The chromidia of Actinosphærium can be traced readily to the nucleoli of the nuclei, with which in many instances a direct connection may be traced and they, therefore, have the same composition as the amphi-nucleoli or karyosomes,

namely, nucleolar substance and chromatin. When they break down, with the formation of yellowish-brown pigment granules, the chromatin as well as the nucleolar substance disappears. Hertwig draws a sharp distinction between the chromidial-net of the Monothalmia and the chromidia of Actinosphærium. The latter represents superabundant nuclear material destined to be destroyed or got rid of while the former is actively functioning extra-nuclear nuclear material from which secondary nuclei may be organized. The chromidia of Actinosphærium do not form new nuclei. The periods of recovery from depression, as shown by resumption of feeding and multiplication, are preceded and marked by efforts to reduce the amount of nuclear material and the changes above outlined indicate the methods used for this purpose. It is interesting to note that these are physiological methods, for, previous to encysting, Actinosphærium reduces the number of its nuclei by from 90 to 95 per cent and by very much the same methods of nuclear destruction.

We can, therefore, agree with Hertwig that, in these animals depressed from increased functional activity, the kern-plasma relation is markedly upset, and it is clearly proven that recovery or regeneration is marked by partial or total return to the normal size-relation between protoplasm and nuclear material. This is accomplished largely by the breaking down and throwing out of redundant nuclear material and, thus, the normal balance between nuclear material and protoplasm is restored. The protoplasm exerts to a remarkable degree its property of breaking down nuclear material.

(2) Hertwig (1903) and his pupils have shown that for certain protozoa (Actinosphærium, Dileptus, Paramæcium) the nuclear material is increased and the protoplasm is diminished in amount during hunger. In starved cultures of Paramæcium, Kasanozeff found that, after division, their bodies are reduced in size when compared with fed Paramæcium and that the macronuclei, on the other hand, are not only relatively but actually larger.

(3) *Changes of temperature.*—Hertwig (1903 and 1906) has shown that when frog's eggs are exposed to low temperatures the nuclei increase in size and further that this may be concerned in sex determination, for when frog's eggs are developed in cold temperatures, the proportion of males is greater than occurs at ordinary temperatures.

H. Marcus (1906) has studied the influence of cold on the kern-plasma relation with interesting and conclusive results. He developed the fertilized eggs of *Strongylocentratus lividus* at 9° C., 19° C., and 22° C., and found that in the blastula stage the nuclei of those bred in the cold were distinctly larger than in those kept at the higher temperatures.

Functional increase of the nuclear material with chromidiosis occurs, as has been pointed out, in sex, gland, ganglion and muscle cells, and it will repay us to review at this point briefly these conditions in sex and secreting cells.

Sex cells.—Hertwig sees in the fact that egg cells, which, as is well known, have very large nuclei, cast off nuclear material into the protoplasm to form the yolk, and, in many species, further reduce their nuclear material by the ripening divisions, another support for the kern-plasma relation theory. Popoff (1907) has recently shown that in the developing egg cells of Paludina and *Helix pomatia,* at certain stages of division, chromidia are extruded from the nuclei.

Secreting cells.—There are three characteristics of gland cells which bear upon our theme—the variations in size and structure of the nucleus, the occurrence in the cytoplasm of bodies which have the reactions of chromatin and nucleolar substance, and the relation of some of the bodies to the so-called "secretion granules." According to Garnier (1900), during secretion, the gland cell nucleus may increase five times in size, and the nucleoli also are increased in volume, while the nuclear chromatin diffuses in the nuclear sap and passes to the protoplasm and forms chromatin clouds, or to the basal filaments.

The presence in the protoplasm of the gland cells of chromatin-staining material, as already mentioned, has been described by a number of authors under the names of nebenkerne, basal filaments, ergastoplasma fibrils, mitochondria, chromidial apparatus, etc. These masses of nucleolar substance and chromatin, staining with basic dyes, occur sometimes as an alveolar meshwork, sometimes as parallel rods, or as irregularly branched fibrils running usually in the long axis of the cell. In some cells, notably the panereas cells, they may occur as large coils of fibrils, with a homogeneous centre. These lie near the nucleus and represent the nebenkerne of Ogata, Nussbaum and others.

Whatever the names given by various authors to these bodies may be, most of them agree in certain particulars; namely, they stain with chromatin dyes and are intimately connected with the nuclei; often they are continuous with the nuclear membrane, and sometimes they are continuous with the nuclear chromatin. Usually, they are most abundant and conspicuous in resting cells and gradually diminish in size or even disappear during secretion. Another set of bodies are the plasmosomes (composed of nucleolar substance in Hertwig's sense) of Ogata which in the pancreas cells and certain mucous cells make their way from the nucleus into the protoplasm. Launoy (1903) has described in secreting cells division of the nucleolus with the breaking up of this body into fine, vacuolated particles, which pass into the protoplasm and gradually become secretion granules. During rest, the extranuclear portion of the nuclear apparatus, then, is rebuilt and during secretion (active function), this material is used up and the nucleus enlarges and shows evidences of hyperactivity. The nuclear material may go out into the protoplasm as karyosomes (nucleolar substance plus chromatin) or as plasmosomes (nucleolar substance minus chromatin). To discuss the further relation of the nuclear materials to the formation of the interesting organoids or secretion granules would lead us too far afield. Suffice it for the present purpose, to call attention to the fact that in actively functioning gland cells, the kern-plasma relation is disturbed, due to the growth of the nucleus and of the chromidial apparatus, and that this activity of the cell is marked by an increase in both production and consumption of nuclear material.

Divisional Increase of Nuclear Material, and the Relation of "Depression" to Conjugation of Cells and their Connection with the Kern-plasma Relation.

Besides the self-regulation and reconstruction of cells, as evidenced by their power to reduce superabundant nuclear material by throwing off chromidia (as in overfed Actinosphæria and in egg cells), and by the using up of nuclear materials by gland cells during secretion, Hertwig has shown that the same effects may be reached by division. It is a common observation that before division the nucleus increases in size, and this, of course, produces an upset in the normal kern-plasma relation. Hertwig and his pupils have demonstrated that when cells are submitted to conditions which increase the amount of nuclear material (as overfeeding, starving, change of temperature) they divide. Overfed protozoa divide rapidly up to a certain point. The marked increase of nuclear material brought about in egg cells by fertilization is followed by the rapid divisions of the segmentation process.

According to Hartwig's (1903) conception, under normal conditions the nucleus and the protoplasm are in a state of equilibrium or tension, which may be upset, in various ways, to a degree sufficient to lead to division; sometimes nutrition, sometimes starvation, and at other times other factors may upset the equilibrium and act upon the unknown factor governing division.

In the segmenting egg, with the enormous disproportion between nucleus and protoplasm, and in which the divisions follow each other in such rapid succession, outside agents, such as food, may be disregarded. When the divisions cease, they are not resumed without the action of a fresh stimulus from without, as food for instance, which would change the equilibrium again and be followed by renewed divisions.

In support of his contention that when the proportion of nucleus and protoplasm passes beyond a certain degree, division will not occur until the protoplasm increases in amount, Hertwig quotes the observation of Gerosimoff on the alga Spirogyra, in which, when submitted to cold, on division, one division product may contain no nucleus and the other two nuclei, or one nucleus of double size: the latter cell cannot divide until its protoplasm has increased to a very great degree. Then, on division very large fibrils with large nuclei are produced. He holds that the division process is governed by two factors: (1) the protoplasm has and may use its power of splitting up nuclear elements, and (2) the nucleus has a sufficient capacity to assimilate products from the protoplasm. Arrest of division will occur when one or both of these conditions are not fulfilled.

Our knowledge of the life conditions of cells has been greatly furthered by the studies of Maupas, Calkins, Hertwig and Popoff upon "depressed" protozoa, which have exploded Weissmann's doctrine of the immortality of the protozoa.

These observations have been made chiefly upon infusoria, cultivated in the laboratory for long periods of time. The organisms will thrive and multiply for a number of generations and then die out. During the culture the organisms show alternate waves of rapid increase and of cessation of division. In the periods of cessation of division or periods of depression, as proved by the studies of Hertwig and his pupils, the organisms are characterized by a marked upset in the kern-plasma relation. The nuclear material, in Paramæcium and Actinosphærium, for instance, is very much increased, and, unless the cells can reorganize themselves, they die out. As previously pointed out, this may be done by dissolution, degeneration and extrusion of nuclei, by chromidiosis, and by the action of certain salts (Calkins) and, in the infusoria, by conjugation. In Paramæcium, for instance, the epidemics of conjugation coincide with the periods of depression; and conjugation, with the incident divisions and fusions of micronuclei, and the degeneration of the old and the formation of new macronuclei, is the natural and most effective method of recovery from depression, and causes a rejuvenescence of the cells, through the reconstruction and restoration of the kern-plasma relation which takes place. Hertwig regards this as the most important provision for prevention of physiological degeneration and of the extinction of the species. In metazoa, this is accomplished through the union of the sex cells, while the somatic cells, debarred from this, must ultimately perish from physiological degeneration—the cause of physiological death.

Nuclear Dimorphism and Nuclear Duality.

A discussion of the kern-plasma relation theory cannot be complete without a consideration of these two factors.

Many of the infusoria, for instance, possess two nuclei—a macronucleus, which is large, and apparently governs the metabolism of the cell, and a micronucleus, which, as its name implies, is small, and which shows no special signs of activity except during division and conjugation, when it actively multiplies. The former contains evidently the somatic nuclear material and governs the ordinary cell activities, while the latter is distinctly a germinative nucleus, and in it reside the divisional and constructive activities of the cell. At conjugation, in Paramæcium, for instance, there is active division of the micronuclei in the conjugating pair, and daughter micronuclei from each animal pass to the other and conjugate. The nuclei resulting from this conjugation divide and form not only the micronuclei, but the new macronuclei as well, the old macronuclei having degenerated and been cast off. The macronuclei have been likened to the chromidial apparatus of certain protozoan and egg cells, and the micronuclei to the nuclei of ripe sex cells.

As is well known, there is a great variability in the arrangement of the nuclear material, especially in the lowest vegetable and animal cells, and, in many forms, the arrangement may be changed at different periods of activity and development. In the vegatative stage, the nuclear material of bacteria is "diffused"—in certain forms, as in *B. bütschlii* and *B. sporonema* (Schaudinn), as granules (chromidial-net of Hertwig) at the nodal points of the protoplasmic meshwork; while, at division and spore formation, it collects into a mass with the appearance and behavior of a morphological nucleus. In 1894, Schaudinn described in *Calcituba polymorpha*, the formation

of definite morphological nuclei from diffused chromatin. In some protozoa, the nuclear material may be in small scattered masses, while in others, in addition to these, there are larger masses resembling morphological nuclei, but without nuclear membranes or differentiation of the nuclear structures, such as the lining meshwork. Above these, come fully developed morphological nuclei after the type of those found in metazoan cells. In many cases, both among protozoa and egg cells, associated with these morphological nuclei, there is a more or less well defined chromidial apparatus. Here we meet with another type of nuclear dimorphism. In some cases, as in egg cells and in certain protozoa, as Actinosphærium, *Noctiluca miliaris,* etc., during division, the chromidial apparatus represents somatic chromatin. In other cases it is clear that new nuclei may be formed from it, as from the chromidial-net of *Arcella vulgaris.* In studying nucleus formation in certain rhizopods, Schaudinn (1903) observed that the chromidial masses in the protoplasm were divided germinative nuclei.

Léger (1904) found, in the gregarine Stylorhynchus, that, in the division leading to sporoblast formation, two kinds of nuclei appear: the germinative and the somatic. The former give rise to the nuclei of the sex cells and the latter to numerous somatic fragments.

Kuschakewitsch (1907) has recently studied two gregarines which, especially in the protomerit, have a well marked chromidial apparatus. During sporulation, the nuclei seek the periphery of the cyst, and there resolve into a fine chromidial net-work which later condenses with the formation of new nuclei which divide.

Schaudinn and Von Prowazek (1904) regard the nucleus of a resting trypanosome or herpetamonas as two nuclei bound in one. In the development of the ookinete into the trypanosome this double nucleus separates into two—one becoming the germinative or sexual nucleus, and the other the nucleus of motility or blepharoplast, from which the motor apparatus is developed. As Goldschmidt has pointed out, these two nuclei, the one propagatory, the other somatic, having the same number of chromosomes and the same ripening processes, are comparable to the micro- and macronuclei of the infusoria.

This doctrine of nuclear duality, founded by Schaudinn and elaborated by Goldschmidt (1904) and Goldschmidt and Popoff (1907), is, it is readily seen, intimately connected both with Hertwig's kern-plasma relation doctrine and the chromidial doctrine. Goldschmidt's conclusions may be condensed as follows:

(1) Each animal cell is doubly nucleated, containing a somatic and a propagatory nucleus. The first controls the somatic functions, as metabolism and motion, the second contains the hereditary substances and has the property of forming a new somatic nucleus.

(2) The two nuclear types are usually united in one nucleus —the amphinucleus. Separation may occur to a greater or less degree; usually, at most, into a predominantly propagatory or mixed nucleus—the cell nucleus in the ordinary sense and the chief mass of the somatic nucleus or chromidial apparatus.

(3) Complete separation may occur—as in the propagation of protozoa and in oogenesis and spermatogenesis.

(4) In tissue cells the separation may be recognizable. In the nuclei of egg cells two kinds of chromatin are to be distinguished, idio-chromatin and tropho-chromatin. The separation is evident when a part of the somatic nucleus is in the plasma as chromidial apparatus, as occurs in gland cells and in egg cells during yolk formation. A nearly complete separation may occur in ganglion and certain muscle cells, in which the somatic nucleus is represented by chromidial apparatus, which, of course, is built and replenished by the propagatory nucleus.

(5) Cells with only a propagatory nucleus, which can, however, reform the somatic nucleus, are represented by the gametes of protozoa and nurse cells of the ovary and possibly also by certain spermatozoa.

(6) Cells with only somatic nuclei are represented by the "rest bodies" of gregarines and the "diminished" cells of Ascaris and certain muscle cells.

For Goldschmidt a well developed chromidial apparatus denotes active function or capacity for function, and serves to bring an increased amount of somatic or metabolic nuclear substance into more intimate relation with the protoplasm than is possible when the whole of such material is collected within the nucleus.

Lately Goldschmidt and Popoff (1907) have found additional support for the chromidial apparatus doctrine in comparing the spongy centrosome of Actinosphærium, the sphere of *Noctiluca miliaris* and the chromidia extruded from nuclei in the ova cysts in Paludina and in *Helix pomatia,* in all of which at the beginning of division chromatic particles pass out of one pole of the nucleus and lie in the protoplasm. They regard these masses as chromidial apparatus (as Hertwig had previously done) and as representing somatic nuclear material, while the nucleus represents the propagatory nuclear substance.

General Biological Considerations Suggested by the Kern-plasma Relation Theory.

In the foregoing pages I have traced the leading theories of the Munich School of Zoology—those of the kern-plasma relation, the chromidial apparatus and nuclear duality—at some length, and have, I hope, indicated some of the numerous lights they throw upon the biology of the cell. I have also endeavored to make clear the fact that these theories, while separate and distinct from each other, are also closely interwoven.

The essence of the kern-plasma relation theory is that for each cell there is a definite size relation between nucleus (nuclear material) and protoplasm which may not be upset beyond certain physiological limits without serious consequences, and that in each cell there is not only a normal mass relation between nuclear material and protoplasm, but the protoplasm possesses powers to preserve a normal equilibrium between the two. A cell is normal only so long as this balance is preserved within proper limits. In growing cells, the bal-

ance is struck by growth of protoplasm; in older cells, by the casting out of nuclear material into the protoplasm—chromidiosis—where it is destroyed and thrown off and by dissolution and degeneration of nuclei. The chief causes of the upset of the kern-plasma relation are increased function, starvation, change of temperature, fertilization (in egg cells) and the group of other conditions which lead to division. In these states the nucleus takes up an increased amount of material from the protoplasm.

Increased function, whether brought about by overfeeding or by various other stimuli, such as those that act upon gland, muscle and ganglion cells, causes hypertrophy and hyperplasia of the nuclei of protozoa and of many metazoan cells. In the protozoa, this increase of nuclear material is reduced to the normal relation to the protoplasm most readily, perhaps, by division; when this fails chromidiosis and dissolution and extrusion of nuclear material are called into play. If these means are not sufficient, the cells go into a state of depression from which they can often recover only by conjugation, a process in which not only regulation and reconstruction, but nuclear reduction, are prominent. The protoplasm has not only the power of using up nuclear material in function, but of breaking it down when it is present in excessive amount.

In gland, muscle and ganglion cells, usually, the excessive nuclear material is used up in functional activity, but I may venture the suggestion that this is not always the case, for witness the evidence of nuclear reduction by chromidiosis furnished by the frequent occurrence of pigment in muscle and ganglion cells, and the fact that gland cells are constantly being worn out and replaced.

Did gland, muscle and ganglion cells not possess these natural means of reducing functional increase of nuclear materials, they would have but two alternatives; to die from giant nucleus formation or to divide. It is evident that in these cells the balance is nicely adjusted and, in this adjustment, muscle and ganglion cells in the higher animals have lost their divisional nuclear material. The latter is preserved in gland cells, however, for in most glands the cells cannot only divide to repair losses from various causes, but when the stimulus is increased, glandular organs (the thyroid for instance) may undergo hyperplasia with marked divisional activity of the gland cells. In an interesting and suggestive work on the life history of the thymus cells, H. Marcus has traced in these cells periods of depression associated with upset of the kern-plasma relation which lead often to various degenerations of both nucleus and protoplasm and follow rapidly repeated divisions. He has also found that the thymus cell with disarranged kern-plasma relation may regulate itself and approach the normal by reducing its nuclear material by means of chromidiosis.

This self-regulation of functioning cells cannot go on forever, however, for all organisms, both protozoa (as Maupas, Calkins and Hertwig have shown, contrary to Wiessmann's theory that protozoa are immortal) and metazoa die sooner or later. This physiological degeneration of cells, as Hertwig has pointed out, is due to their lack of the power of permanent self-regulation and proper reconstruction of the kern-plasma relation. In protozoa, it may be overcome by conjugation, but in metazoa this is possible only for the sex cells, the only metazoan cells capable of continuous proliferation. A possible exception here is furnished by the cells of certain transplantable tumors of rodents, and those of malignant tumors of man and the higher animals, and here the possibility of fertilization must be borne in mind. In fact, Farmer, Moore and Walker have claimed the demonstration of heterotypical mitoses in certain tumor cells.

When the functional activity of cells causes a continual increase of nuclear material beyond a certain limit, the cell goes into "depression," from which it may or may not be able to extricate itself by the exertion on the part of the protoplasm of its power to destroy nuclear material or by conjugation. In an organism like Actinosphærium, for instance, in which conjugation is isogamous, conjugation in "depression" is often impossible because the protoplasm cannot break down nuclear material sufficiently for cyst formation to occur, or, if encystment takes place, the cells in the cyst are too abnormal for conjugation, as Hertwig has shown.

There is considerable room for confusion between functionally active somatic chromidia of protozoa and of gland, muscle, ganglion and other tissue cells, true chromidial apparatus, and the generative chromidia on the one hand and the chromidia signifying reduction of nuclear material on the other. But a sharp distinction between these three types of chromidia is essential. Goldschmidt includes the chromidia of depressed protozoa, dividing protozoa and egg cells with the chromidia of functioning tissue cells as functioning chromidia under the term chromidial apparatus. Hertwig disagrees with this view and regards the chromidia of depressed and dividing cells as useless, nonfunctioning nuclear material, to be got rid of in the effort of the cells to regulate their kern-plasma relation.

In my opinion, the balance of evidence is in favor of Hertwig's position. It seems to me best to reserve the term chromidial apparatus for evidently functionally or divisionally active chromidia. Perhaps the best examples of functionally active chromidia are furnished by certain muscle, ganglion and gland cells. In these cells, although the nucleus increases in size during function, it of itself does not supply sufficient nuclear material for such large and active cells; therefore, extra-nuclear nuclear material is necessary to raise the kern-plasma relation balance, as well as to bring the nuclear material into closer relation with the protoplasm.

There is no doubt that many bodies in reality representing degeneration of nucleoli and of plasmosomes or examples of chromidiosis have been confounded by pathologists with parasites.

In conclusion it may be suggested that the chief problems of cellular pathology upon which light may be shed by these theories are the autochthonous pigmentations, the hypertrophies and the hyperplasias and their fate, the proliferation of cells under the influence of parasites, and lastly, the biology of tumor cells.

The relation of chromidiosis to pigment formation I (1908) have discussed in a recent article. The other subjects are now under investigation by Dr. O. T. Schultz and myself and I will not dwell upon them at the present time, except to call attention to the fact that Hertwig, in his article on the physiological degeneration of *Actinosphærium eichorni,* has recognized the many points of resemblance between the conditions obtaining in this organism in depression and those occurring in the cells of malignant tumors. In both there occur atypical mitoses, hypo- and hyper-chromatism of nuclei, increase in the size of the nuclei and the same types of nuclear degeneration.

Note.—Since this was written, two interesting and important articles bearing on the subjects discussed in this paper have appeared. They can be read with profit by all who are interested in the physiology and pathology of the cell. (See H. Marcus, Beiträge zur Kenntniss der Gymnophionen. Ueber das Schundspaltengebiet. Die Thymus, pp. 734-767. Arch. f. mikroskp. Anat. u. Entwicklungsgesch., 1908, Bd. 71; and Theodor Moroff, Die bei den Cephalopoden vorkommenden Aggregataarten als Grundlage einer kritischen Studie über die Physiologie des Zellkerns. Allegemeiner Teil., pp. 148-213. Arch. f. Protistenk., 1908, Bd. XI, Erstes Heft.)

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FRITZ SCHAUDINN.

A REVIEW OF HIS WORK.[1]

By OSCAR T. SCHULTZ, M. D.,

Lecturer on Pathology and Protozoölogy, Western Reserve University, Cleveland, Ohio.

The work of Schaudinn is, perhaps, not very familiar to the reader of medical literature, although the discovery of the syphilis organism gave him considerable prominence even in the minds of those who confine themselves to the reviews of purely medical matters.

Fritz Richard Schaudinn was born on the nineteenth of September, 1871, at Roesiningken, a village of East Prussia. He obtained his degree of Doctor of Philosophy on the third of March, 1894. He died on June the twenty-second, 1906. Into this short life of less than thirty-five years, into a working period of twelve years, there was crowded a wealth of work, which, judged by the standard of quantity alone, must stamp the author as a remarkably indefatigable worker. Judged by the higher standard of quality, his work makes of him a genius, one of those truly wonderful master-minds that appear only once in a long period of time. When he died scientific medical research lost its most brilliant exponent, a man destined by training and ability to carry us far along certain lines of work. Although much progress will undoubtedly be made along the paths marked out by him the fullest possible measure of that progress will not be realized until there shall appear another with the trained technic, the keen observation, and the intellect of Fritz Schaudinn.

Concerning his early education little need be said. He has been dead too short a while for time to have had an opportunity to cast about his life that haze which makes it possible for historians to quarrel as to which teacher or which particular event is of chief importance in determining the mind's development. As a youth he attended the Gymnasium at Insterburg and at Gumbinnen, leaving the latter place in 1890 to enter the University of Berlin. His original intention was to take up the study of philology. His interest was soon transferred, however, to zoölogy, and it was in this latter subject that he obtained his Doctor's degree. His thesis was a description of *Myxotheca arenilega*, a new species and new genus of the Foraminifera. In July, 1894, he went to Bergen, Norway, for the purpose of collecting material, returning to Berlin in October as Assistant in the Zoölogical Institute.

During the year 1894 there appeared a number of papers which mark the beginning of Schaudinn's interest in the variations of the reproductive process among the protozoa. For Calcituba and several other marine Foraminifera he described, as a new type of nuclear multiplication, the loss of the membrane of the adult nucleus, the distribution of the chromatin throughout the cytoplasm, and the formation of multiple daughter nuclei from the scattered chromatin granules. Nine years later Richard Hertwig described a similar phenomenon of chromatin diffusion in *Actinosphærium eichorni* and gave to it the name of chromidium formation. In the case of this latter organism, however, Hertwig showed that the process is associated with certain of the vegetative functions of the cell and not with reproduction. Further work, particularly by Schaudinn, by Hertwig, and by Goldschmidt, established the important rôle that chromidium formation plays in the reproduction and the nutrition of many protozoan cells. In this doctrine, which forms the major part of Hertwig's kern-plasma relation theory, we have a light which must lead us through the darkness that marks the present state of cellular physiology and pathology.

Another of Schaudinn's contributions of 1894 was the description of *Camptonema nutans*, a multi-nucleated rhizopod supplied with radiating pseudopodia. The latter, besides the already well-known movements due to flowing of the plasma, have the power of rotation and of flexion and extension. The axial fiber of each pseudopod passes into the cytoplasm and its inner end becomes attached to a nucleus by a cap-like enlargement. This intimate relationship of external organelle and nucleus Shaudinn believed to be an expression of such a controlling influence of the latter over the former as exists in metazoan spermatozoa. The correctness of this view was proven by his later work upon the development of the locomotory apparatus of *Trypanosoma noctuæ*, and the idea constitutes an important addition to our knowledge of the functions of the nucleus.

In 1894 there appeared, also, the description of multiple division of the shelled amœba, *Hyalopus dujardinii*, with the formation of flagellated young forms. This observation, that an adult protozoan with the organelles characteristic of one class may produce young with the organelles supposed to be specific of an entirely different class, may be considered the beginning of Schaudinn's long series of additions to our knowledge of the protozoan life cycle. The importance of the recognition of the various changes that a protozoon may show in its life history has been justly insisted upon by Calkins. He would make the presentation of the entire cycle of a protozoon the prerequisite for its acceptance as a new species. He demands some ground principle which shall unify the science of protozoölogy. Concerning Schaudinn's part in supplying this principle Calkins says: "It was the genius of Schaudinn to establish such an unifying foundation, and in his clear perception of the importance of the life cycle we have the keynote of our present-day conception of the protozoa." In my attempts to teach to students an outline

[1] Read before the Experimental Medicine Section of the Academy of Medicine of Cleveland, January 10, 1908.

of protozoölogy I, likewise, have been struck by the large share that Schaudinn has had in the advancement of this side of the subject. I have been accustomed to consider the reproduction of the protozoa the most important chapter in protistology. In looking over the notes in which I have tried to summarize the nuclear and morphological variations that make up protozoan life histories I find that the chapter is largely a recapitulation of Schaudinn's work.

Dimorphism of adult organisms has long been known among the Foraminifera. It remained for Schaudinn and Lister, in 1895, independently of each other, to explain the genesis of this condition in *Polystomella crispa,* and to show that the dimorphism is part of a life cycle in which one form, multiplying by flagellospore formation, alternates with the other form, which multiplies by the production of amœbaspores.

Work upon *Amœba crystalligera* in 1894, and the discovery of *Amœba binucleata* in 1895, and of *Paramœba eilhardi* in the following year, resulted in observations upon the finer occurrences in the processes of direct and indirect nuclear division. For Paramœba Schaudinn described a cycle much like that of Hyalopus. The point of chief importance in the former organism is the possession of a nucleus-like body in addition to the true nucleus, both being present in all the stages of the cycle. The true function of this "nebenkoerper" appeared during the division of the flagellospores. During this stage the body acts exactly like a centrosome. Similar conclusions as to the function of the centralkorn of the Heliozoa were arrived at from a study of *Acanthocystis aculeata,* published in 1896. Furthermore, proof of the primary intra-nuclear origin of a centrosome which later becomes permanently extra-nuclear, was furnished. In this respect Acanthyocystis seems to be intermediate between those flagellates possessed of nuclei in which the division material is permanently intra-nuclear and *Paramœba eilhardi* and *Noctiluca milaris,* in which, as in metazoan cells, the centrosome is permanently extra-nuclear. In Acanthocystis there is much the same relationship between the axial fibers of the pseudopodia and the centralkorn as exists between the fibers and the nuclei in Camptonema. The establishment of the kinetic nature of the centralkorn, its control not only of the energy of nuclear division but also of the movements of the external organelles, was confirmed and amplified by later work upon the nature of the blepharoplast of the trypanosomes.

An important fact brought out during the same year in a study of *Actinophrys sol* was the occurrence of fertilization at one stage of the life history by a process intermediate between the partial karyogamy or conjugation of the ciliates and the complete karyogamy or copulation of other forms.

In 1897 Schaudinn, in association with Siedleeki, showed that in certain of the Coccidia there occurs a copulation of sexually differentiated gametes, a process strikingly like the fusion of ovum and spermatazoon. Further results of this work appeared in 1900, when the complete life cycle of *Eimeria schubergi* was published by Schaudinn. This paper is an example of the ideal in research. The array of facts presented indicates the possession of remarkable technical perfection of hands and of eyes, experimental resourcefulness, an intuitive knowledge of what to look for, and the intellect necessary for the proper interpretation of the findings. And above all, the facts are recorded in language that is fascinating.

In 1898 Schaudinn was promoted to Privatdocent in the University of Berlin. The greater part of this year was spent in a collecting trip to the Arctic Ocean. The results of this journey appeared under the combined editorship of Schaudinn and Roemer in a collection entitled "Fauna Arctica," four volumes of which have appeared.

The description of the complete life cycle of the newly-discovered rhizopod, *Trichosphærium sieboldi,* appeared in 1899. So thorough was this piece of work that not a single fact remains to be added to the life history as published by Schaudinn. The cycle of Trichosphærium is not quite so complicated as the coccidian cycle published during the following year, since in the former the copulation is isogamous.

During the same year he was able to report a confirmation of the work of Ross and of Grassi upon the cycle of the malarial parasite, and pointed out the analogies in the life histories of this organism and of the Coccidia.

The extreme biological importance of Schaudinn's observations had become quite evident. The German Government, to whose fostering spirit is due much of the scientific eminence of the Germans, was quick to realize the aid that a man of his training and ability might bring to protozoölogy as applied to medicine. In 1901 he was sent by the Kaiserliche Gesundheitsamt to Rovigno for the purpose of devoting himself more particularly to the pathogenic protozoa. He remained in Rovigno until 1904. This period was marked by the appearance of a number of observations of direct value to medicine. Of these, two very important ones concern the malarial parasite and the intestinal amœbæ. He was able actually to see the entrance into the red corpuscle of the malarial sporozoite, the end stage of the sexual cycle in the mosquito, and of the merozoite, the end stage of the asexual cycle in the human being. Furthermore, he established the fact that the relapse in malaria is due to a peculiar biological modification of the normal cycle of the parasite. He showed that the makrogametocytes, which normally are destined to fertilization in the mosquito's stomach, may remain in the human blood and fail to be fertilized. In the internal organs they reduce their chromatin. Parthenogenetic division results in the establishment of a fresh series of asexual generations, manifested clinically by the relapse.

In 1860 Lambl, and in 1870 Lewis and Cunningham, noted the occurrence of a new species of amœba in the intestinal contents of persons ill with tropical dysentery. This organism was more accurately described by Loesch in 1875 and named *Amœba coli.* For many years there has been considerable controversy between medical men, on the one hand, and biologists, on the other, concerning this protozoon. In amœbic dysentery clinicians saw a fairly well characterized disease. For pathologists, the anatomical findings in this

condition were even more specific. Medical workers became convinced of the etiological relationship of the organism to the disease. The occurrence of an amœba, not to be distinguished from *Amœba coli,* in the intestines of healthy persons caused the biologists to maintain a rather skeptical attitude as to the pathogenicity of *Amœba coli.* For some of them it was only a harmless secondary invader. Others considered it pathogenic, but only after the lesions had been started by bacteria. Before one could state that dysentery is due to an amœba biologists justly demanded morphological differences which would permit one to distinguish between the organism associated with disease and that found in the healthy intestine. It remained for Schaudinn to describe such differences. He showed that in the human intestine there may be present at least two species of amœbæ, very much alike at first glance, but showing marked differences in their modes of reproduction. To the species found only in association with dysentery and its complications he gave the name *Entamœba histolytica.* The other, the one found in the healthy intestine, the one which corresponds more nearly to Loesch's description, he called *Entamœba coli.* There are morphological differences which, now that they have been pointed out, permit us to differentiate the two. Concerning the modes of reproduction, Schaudinn showed that the pathogenic amœba gives rise to a number of small encysted amœbæ whose nuclei are derived from the chromidial network of the parent organism. In the reproduction of *Entamœba coli* a single amœba encysts and two daughter nuclei are formed from the original single nucleus. These undergo reducing divisions, then fuse and fertilize each other. Of the eight daughter amœbæ which are finally formed within the mother cyst each receives a single nucleus produced by the division of the synkaryon.

In the establishment of autogamy among the true fertilization processes we have an hypothesis rich in possibilities for biological research. The work of recent years upon the reproduction of the protozoa, the work of Schaudinn in particular, has completely overthrown whatever last vestige of possibility there may have been in the once famous doctrine of the immortality of the protozoa. Although for many of these unicellular animals no phenomenon of fertilization is known this must be ascribed to a lack of sufficient research, and there does not seem to be any probability that there can be any exception to the general rule that fertilization is necessary for the continued multiplication of every animal cell. In cells of only one kind is there an apparently unlimited proliferation without fertilization. I refer, of course, to the cells of malignant tumors. The gametoid theory of Farmer, Moore, and Walker has not received confirmation, and Bashford and Murray's conjugation of tumor-cell nuclei can be more satisfactorily explained as something else. The continued multiplication of tumor cells without fertilization seems improbable. If fertilization does occur, so primitive a process as autogamy must be borne in mind, and the proof of its occurrence would place one phase of the tumor question upon a firm biological basis.

While at Rovigno Schaudinn published the results of work upon two new species of bacteria. That upon *Bacillus bütschlii,* a parasite of the cockroach's intestine, is extremely important. The organism is characterized by its unusually large size and by the fact that it forms two endogenous spores. In this case, therefore, spore formation is not merely a protective arrangement, but it is also a true reproductive process which results in an increase in the number of individuals. Schaudinn showed that *Bacillus bütschlii* is made up of an alveolar protoplasm, in the interalveolar spaces of which lies a network of granules which are stained by the chromatin dyes. In the division during the vegetative state some of these granules become aggregated at the center of the bacillus, and division occurs through this central mass. In spore formation the greater portion of the granular material becomes collected at each pole into a large mass, which has the morphological characteristics of the nuclei of higher plant and animal cells. Autogamous fertilization then occurs between these two nuclei, followed by the final formation of a spore at each end of the bacillus. Grassi, in 1900, made the statement that the complete life history of not a single bacterium was known. That division could continue indefinitely without a sexual act he considered improbable, and he explained the dying out of certain bacterial epidemics upon the supposition that the conditions necessary for this sexual act were wanting. In view of Schaudinn's work upon *Bacillus bütschlii* in 1902 Grassi's words appear prophetic.

The work upon *Bacillus sporonema* is interesting chiefly because spore formation occurs after an abortive attempt at the ordinary vegetative division. It would seem that sporulation does not happen until the energy necessary for transverse fission is completely dissipated. In a review of Schaudinn's publications upon *Bacillus bütschlii* and *Bacillus sporonema* Mesnil says: "Their importance is very great, at once for the comprehension of the morphology of the Bacteriaceæ, for the general significance of sporulation in the lower organisms, and for the phylogenetic seriation of the phenomena of sexuality."

In 1904 Schaudinn was recalled to Berlin by the Kaiserliche Gesundheitsamt and was made director of the newly-established division for protozoölogy. The first work undertaken after his return was an investigation into the modes of infection in ankylostomiasis, with the object of devising means for the prophylaxis of this disease. Looss had shown that the larvæ of *Ankylostomum duodenale* may enter the body by way of the skin. van Durme had shown the same thing for *Strongyloides intestinalis.* Their views were attacked by the Italian, Piéri. By experiments upon monkeys Schaudinn established beyond controversy that the larvæ of *Ankylostomum duodenale* may penetrate the normal skin and give rise to an intestinal infection.

During 1904 Schaudinn published two further papers, the results of work done while at Rovigno. Of these, one was purely practical in nature, like the Ankylostomum work. By the prophylactic treatment with quinine he freed the village

of St. Michele di Leme, in which malaria was endemic, of this disease.

The other, upon the alternation of generations and of hosts of two of the blood parasites of a species of owl, may be considered the most important of all of Schaudinn's researches. This paper is too rich in valuable ideas to permit of adequate condensation. Only three of the more epoch-making points may be stated.

Firstly, he showed that *Halteridium noctuæ,* a parasite of the red blood corpuscles, and *Trypanosoma noctuæ,* a parasite of the plasma, are portions of a single cycle, the sexual part of which occurs in a mosquito. In other words, he established the intimate relationship of the Hæmosporidia and the Trypanosomidæ, two groups which had previously been widely separated in the zoölogical classification of the protozoa. Of the four classes of the protozoa three were fairly sharply characterized by their external organelles. The members of the remaining class, the Sporozoa, had in common only their obligate parasitism and their reproduction by multiple fission. Recent work has shown that the latter process is not at all limited to the Sporozoa. Schaudinn's work, therefore, was revolutionary. Based upon it and upon the confirmation that it has received Hartmann very recently has proposed a classification from which the Sporozoa, as a class, have been removed, and in which the Hæmosporidia and the Trypanosomata have been united to form a new flagellate order, Binucleata.

Secondly, Schaudinn traced the derivation of the blepharoplast of the trypanosomes from the nucleus by a heteropolar mitosis, and the development of the motor apparatus from the former by a second mitosis.

Thirdly, he established certain points of fundamental importance for our conception of the process of fertilization.

One portion of the owl parasite research illustrates the thoroughness that marks all of Schaudinn's labors. In following out the life cycle it was necessary for him to work with the mosquito. He added a number of new facts relating to the anatomy and physiology of this insect.

In May, 1905, Schaudinn, working in collaboration with Hoffmann, announced the presence of a characteristic spiral organism in certain of the products of syphilis. This organism they called *Spirochæta pallida.* Several other short papers followed in rapid succession, all dealing with syphilis. In these earlier papers it was not claimed that *Spirochæta pallida* is the cause of syphilis. Schaudinn and Hoffman contented themselves with a description of the organism and with statements of the lesions in which it had been found. In two years there has appeared an immense literature dealing with the relationship of *Spirochæta pallida* to syphilis. It is unnecessary here to go into the arguments which favor the etiological relationship of the organism to the disease. They may be summarized in the brief statement that in the minds of competent observers such a relationship has been established. The final solution of the much-discussed question of the etiology of syphilis, important as it was, brought into play only one of the many qualities which made Schaudinn pre-eminent. I refer to his extraordinary training in the use of the microscope, a training which permitted him to see what had for so long entirely escaped numerous investigators.

In a paper published in October, 1905, Schaudinn described the morphological characteristics of several species of spirochætæ. He showed that the outline of a cross-section of the body is flattened because of the presence of an undulating membrane, that there is present a condition of nuclear dualism, and that the body form is flexible rather than fixed. He concluded that the spirochætæ are protozoa and that the genus is closely related to the Trypanosomata. For *Spirochæta pallida* he could not certainly demonstrate an undulating membrane. He stated, further, that the body outline in cross-section appears circular, and that at each end there is a flagellum-like prolongation of the periplast. These characteristics warranted the establishment of a new genus, Treponema, for the syphilis parasite.

In the wealth of material published by Schaudinn up to this period he had confined himself to terse presentations of actual observations. He neglected the theoretical considerations of his work. For this he has been criticised. He was only thirty-five at the time of his death. He was not permitted to live to that Oslerian age when a man may cease active productive work and may properly begin philosophical theorizing. However, on the thirteenth of June, 1905, in a paper entitled "Neuere Forschungen über die Befruchtung bei Protozoen" and presented before the Deutsche Zoölogische Gesellschaft, he did state some of the theoretical conclusions to which his work had led him.

Nuclear dimorphism is the rule among the highly-organized Infusoria. In the members of this class the relationship of the micronucleus to division and to conjugation, and that of the macronucleus to the vegetative functions of the cell have long been known. In the work upon *Trypanosoma noctuæ* Schaudinn had established the origin of the blepharoplast and of the nucleus from a single nucleus. He had shown, also, that the function of the blepharoplast is a kinetic one, controlling the energy of mitosis and the movements of the motor apparatus. He postulates, therefore, that nuclear dualism is a condition common to all protozoa; in some, evidenced by the presence of two distinct nuclei, as in the Infusoria and the Trypanosomata; in others, only by physiological differences at some stage of the life cycle. The possession of nuclear properties, some of which are somatic or vegetative in nature, the remainder reproductive or animal, gives to every protozoan cell two forces which are constantly antagonizing each other. There is a perpetual tendency for one or the other of these forces to become predominant. If the vegetative chromatin gains the upper hand, sexual differentiation into a female cell occurs. If the animal characteristics win out at the expense of those of a somatic nature, differentiation into a male cell results. When sexual differentiation has been produced the antagonism is at its height and will lead to cell death because of the final complete loss of the characteristics of the weaker nature. The death of the cell is inevitable unless there is

produced a balance between the antagonistic nuclear forces. This is accomplished by fertilization, and the result is an indifferent cell in which the warring nuclear properties are approximately balanced and in which the struggle can begin anew. The fertilization, when it occurs, is a double one. The propagatory chromatin of one cell fuses, finally, not only with chromatin of a like nature in the other cell, but also with the somatic chromatin.

The correlation of Schaudinn's views upon nuclear dualism and upon its relationship to fertilization and of Hertwig's kern-plasma relation theory and its bearing upon fertilization need not be attempted at this time. I do not think that they are at all antagonistic. They harmonize with each other and complete each other. If both are borne in mind they form a combination which makes a working hypothesis that ought to yield results in the investigation of a number of problems of interest in pathology and physiology.

Early in 1906 Schaudinn was called to Hamburg by the Institut für Schiffs- und Tropenhygiene to become the head of the division for protozoölogy which he was to organize. Here he continued his work upon syphilis. Several short papers upon this subject were published after the author's death by von Prowazek. From a study of sections treated by the silver nitrate method Schaudinn had become convinced of the etiological relationship of *Treponema pallidum* to syphilis. He also adduced further facts to establish the longitudinal division and the protozoan nature of the parasite.

In the twelve years of his working life Schaudinn saw protozoölogy become a very important branch of zoölogy, and, largely through his own work, saw it add much to general biological knowledge. He saw protozoa study become a science of great value to medicine, not only through the results it has yielded in investigations of the etiology of disease, but also through the help that it offers toward the solution of many general problems. He saw the contributions to the literature of the subject reach such numbers that they demanded a publication devoted to them alone. This journal, the Archiv für Protistenkunde, he founded in 1903.

What would have been the ultimate results of Schaudinn's labors, had he lived to complete them, cannot be imagined until they shall be taken up by another equally gifted. In the development of his own work, his earlier purely biological researches and the transition to the later ones more directly applicable to pathology, is foreshadowed the path which pathological research must take in order to add anything fundamentally new to our knowledge.

THE METHODS OF THE HENRY PHIPPS INSTITUTE FOR THE STUDY, TREATMENT, AND PREVENTION OF TUBERCULOSIS IN PHILADELPHIA.[1]

By JOSEPH WALSH, M. D., Philadelphia.

The invitation to read a paper before the Laennec Society was accompanied by the request that the paper be on the detailed workings of the Henry Phipps Institute. This is therefore my excuse for the paper.

The Phipps Institute was opened on February 1, 1903, for the study, treatment, and prevention of tuberculosis, and the word "study" was designedly put first.

The institute comprises a dispensary and a hospital. The wards of the hospital accommodate only fifty-two cases, eighteen women and thirty-four men. The work was inaugurated with three physicians, the number of whom was gradually increased to thirty-two. These physicians are divided as follows:

A medical director, four laryngologists, a dermatologist, a pathologist, a bacteriologist, a neurologist, an ophthalmologist, a genito-urinary surgeon, and twenty-one clinical physicians.

In both the dispensary and hospital only tuberculous cases are treated, and it is insisted upon that they be destitute. If they are capable of paying a physician even fifty cents a visit they are referred to their home physician.

[1] An address delivered before The Laennec, A Society for the Study of Tuberculosis, at the Johns Hopkins Hospital, March 19, 1908.

There are in the present temporary quarters no facilities for treating surgical cases, and hence no attempt is made to treat them. The only operations ever done in the hospital or dispensary have been the opening of an ischio-rectal abscess, the tapping of a pleural effusion, the introduction of a tube for empyema or an urgent tracheotomy.

It happened that the man chosen by Mr. Phipps to be director of the institute was already director of a large sanatorium for the treatment of early cases. In addition to this sanatorium there was already three hospitals for early cases in and about the city of Philadelphia, and it appeared both to Mr. Phipps and Dr. Flick that the most good could be accomplished by a hospital for advanced cases. The hospital was made, therefore, for these cases only.

The good accomplished by a hospital for advanced cases is more in the way of prevention and study than of treatment. The typical suitable patient for the Phipps Institute hospital is a member of a very poor family in an advanced stage of consumption who is not only a burden to the rest of the family on account of the care required, but is also probably infecting other members of the family. A concrete example would be the father of a family in which there were small children. On account of the illness of the head of the house, the wife is obliged to work for the support of the family, and when she

is at home is obliged to care for the children and the patient. It is almost impossible for an ignorant housewife to thus take proper care of a patient, especially without infecting herself, or without allowing the children to become infected. It is also practically impossible in our day for a woman to get sufficiently remunerative work to support such a household. The removal, therefore, of this case to a hospital removes one person from the support of the worker, removes a patient requiring considerable care from the hands of an ignorant individual already over-worked, and prevents the possibility of further contagion in the household. The patient is kept in the Phipps Institute until he either recovers sufficiently to do a certain amount of work or until he dies.

In order to further the study, before the patient is admitted to the institute his nearest legal relative is obliged to sign a certificate permitting an autopsy in case the patient dies in the hospital.

In the hospital there are no resident physicians. The fifty-two cases are divided up among ten visiting physicians who visit the hospital at least every second day. The hospital has a history record sheet made up by the staff from the comparison of a number of such blanks gathered in from all parts of the world. Each year this blank has been partially changed, corresponding to the experience of the members of the staff. This history sheet, therefore, is as complete as the staff deems necessary to show the physical condition and sociological status of the patient, although it is still changed somewhat every year. It is filled out entirely by the visiting physician, in other words, the history is taken in its entirety by men of experience and not by recent graduates. In addition to this sheet, there is a diagram for the outline of physical signs, which is also filled in by the visiting physician. The staff of physicians meets every Monday evening; and once a month, all the histories in the house and in the dispensary are brought before a history censor committee, and any thing lacking on the sheet or diagram is called to the attention of the staff. By this means every history and diagram is kept absolutely complete in all details. In the histories and diagrams it is necessary to indicate not only the abnormal, but also the normal.

In addition to these histories we have what are called monthly summaries. These monthly summaries repeat a certain number of the questions of the history in regard to things that may have changed since the admission of the patient; as for instance, the cough, expectoration, hæmorrhage, curved nails, curved fingers, enlarged glands, etc., and repeat also the diagram. In other words, while the patient is in the hospital a complete examination in regard to symptoms and physical signs is made once a month. This is taken care of in the same fashion by the censor committee, as the original history.

There is also a complete nose, throat, and ear record sheet for any patient who manifests symptoms pointing to disease of these organs, likewise, a complete nervous sheet which is filled out for every house case and many dispensary cases.

Though the cases in the hospital are divided up among the different physicians and each physician has his own set of cases, there is a special understanding which not only allows but encourages every physician on both the house and dispensary staff to examine any or all the other cases. This examination is voluntary and the physician may or may not make a diagram of it. It is particularly requested, however, that a physician making an examination in this fashion, make a diagram and attach his name to it, so that there may be as many examinations as possible, if the case should come to autopsy. It is very common, therefore, at autopsy to find several complete examinations by the physician who treated the case, and several others by other physicians on the staff. This not only makes the autopsy interesting, but causes it to be done in an exhaustive fashion. Like our history sheets, we have a very complete autopsy sheet, every question on which must be answered.

At the end of the year all the statistics relative to cases are compiled and printed in an annual report.

In the dispensary, as in the hospital only absolutely destitute cases are taken. In regard to the financial condition, the word of the patient is taken for the primary examination and treatment. Subsequent to this, however, an inspectress visits the patient's house and if his financial condition is found better than stated, he is refused further treatment.

The history and examination sheets used in the dispensary are the same as in the hospital, and they are filled out with the same exactness. The summary examinations, however, are required in the dispensary not once a month, but once in three months. We have fifteen men in the dispensary, each one spending four hours a week, seeing altogether an average of seven hundred new cases a year, and four hundred old cases. These dispensary physicians come two days a week, spend two hours each time, and see the different cases once in two weeks. It takes about an hour to see a new case the first time, hence they see only one or at most two new cases on any single day. Cases are seen only once in two weeks in order to give sufficient time for changes of condition to be noticed and in order to avoid too much medical interference, which can do harm. I have always thought that the greatest trick I learned in the treatment of tuberculosis was the infrequent seeing of cases. It is not possible to treat every little symptom manifested by a tuberculous patient, and if the patient is seen frequently it is almost impossible to avoid this overmedication, which only does harm.

As soon as the patient comes into the dispensary, whether he is a new or old case, he is handed a spit cup by a nurse who is always present in charge of the dispensary, and he uses the spit cup while awaiting his turn, and takes it with him into the examining room. These spit cups are the regulation paste board spit cups in a brass container. As each patient is leaving, after his first visit, he is given free of charge a set of preventive rules to hang up in the house, one brass container, fourteen spit cups, and a number of paper handkerchiefs, and paper bags. He is shown exactly how to use these different things by the nurse in charge, and instructed in the necessity for their use by the physician.

If the patient is destitute he is frequently ordered milk by

the physician. We have two milk stations in Philadelphia: one at the institute itself, and one in Kensington, in the northern section of the city, about three miles away from the institute. In addition milk is delivered in the western and southern sections of the city through local milk dealers.

Milk is given to the patient under various circumstances and in varying amounts. The most common intention in giving milk is for the nourishment of the patient in order to make him well, and in this case the milk is usually given in quantities of about three quarts per day; it is given, however, also for the purpose of being able to control an advanced case even when it is evident nothing can be done in the way of cure or improvement. All patients coming to the dispensary are given preventive supplies in the shape of spit cups, and paper napkins; only about one-quarter of them are given milk.

When a patient coming to the dispensary is an early case he is usually advised to go to the White Haven Sanatorium for six months, though if his resistance is very good, or if he refuses to go to the sanatorium on account of not wishing to leave his family without support, he is treated in the dispensary and encouraged to come once in two weeks. The nurse visits his apartments or house and reports on it; if he is living in too confined an apartment, the nurse and physician both advise a change. Sometimes this change is accomplished, again it is found practically impossible on account of lack of funds to meet more rent. In this case as much as possible is done at the present home. The wife, or other members of the family are instructed in the communicability of the disease and the steps required in order to prevent infection. They are advised to keep the children outside as much as possible during the day. It is insisted that the rooms be wide open at night, be disinfected immediately by the Board of Health, and be kept clean, practically disinfected thereafter. The wife is instructed to boil all the eating utensils or to wash the patient's separately. She is instructed to use a wet or moist broom in sweeping, not a dry broom; also a wet cloth in dusting, not a dry cloth. It is seen that the patient has a bed to himself, even though a makeshift in the shape of a couch has to be put up.

The nurse visits the patient once in two weeks and reports on the following: The amount of milk received by the patient from the institute; whether or not it is used by the patient: whether or not he is working; whether or not he takes exercise out of doors; sleeps with the windows open; sits in the kitchen; uses a spit cup; uses his paper napkins; burns spit cups and napkins; spits on sidewalk when on street; uses handkerchiefs or rags; whether or not the premises are clean; whether or not there is a back yard and what its condition; how many people there are in the house; how many windows in the house; whether or not there are other inmates in the house sick; whether or not the patient uses stimulants; if the rules of the institute have been hung up in the house; and whether or not she (the nurse) has instructed the patient in the observance of the rules. There is a special printed blank for these questions which the nurse writes out and joins to the history of the patient so that the physician may see at the next visit of the patient the inspectress' point of view in regard to how the patient is co-operating with him. All the answers to the questions which go to show the patient is doing his duty in that description are written in back ink. The things which the patient does contrary to what he ought to do are written in red ink in order to call the physician's attention to them without being obliged to read the whole report.

If the patient is not following the physician's directions, his attention is called to the fact, and if he is found disobeying the emphasized directions, his milk is stopped, if he gets milk, or his treatment, if he merely gets treatment.

If the patient has advanced tuberculosis he is encouraged to come into the Phipps Institute or go to the Philadelphia General Hospital. Sometimes he refuses to come into the Phipps Institute on account of the autopsy requirement and refuses to go to the Philadelphia Hospital on account of it being also the alms house. Such a case is investigated before there is any question of giving him milk and then only in case he cannot be controlled without the milk is he given a quart of milk daily, and then only in case he can be controlled by it.

Even in the dispensary we look more to prevention than to absolute cure, though we try also to accomplish the latter; in other words even in the dispensary we are not satisfied to hold patients as life long milk pensioners. A patient is treated for a definite length of time, as for instance, six months or a year, being carefully instructed throughout this period. We consider then that if we have not cured him, we have at least instructed him so that he should not be a menace to others. If then he has been getting material aid, this aid is stopped. Of course the patient may continue and usually does continue coming to the dispensary for advice.

In some of the European dispensaries, especially the one at Lille, before the patient is examined, he is sent to a bath room and while he is being bathed his clothes are disinfected. This is an added help in the way of instruction and in addition aids in prevention since the patient's clothes are so likely to be infected.

In addition to milk, the French dispensaries supply eggs, meat, coal and sometimes lodging. It also takes care of all the patient's laundry in order to make sure that it is frequently washed and also in order to avoid the possibility of infecting the laundress.

In addition to the hospital and dispensary the Phipps Institute has an extensive laboratory in which all those connected with the institute, work. The laboratory is fitted up for bacteriological and pathological study. Since it is simply a modern laboratory I omit details.

One of the frequent questions asked us is, how much opposition is manifested towards the autopsy requirements for admission to the hospital. It is surprising to know how little opposition is made to it. There are practically only three classes of people who raise any objection whatsoever; first, the Hebrews, since it is definitely against their belief; second, the Irish who have a great sentimental regard for the dead

bodies of their friends; third, the colored people, who fear that the permission to do the autopsy carries with it the sure death of the individual. The Germans and the English make no objection whatsoever, and the objections of the others are so easily overcome that the majority of our patients are Irish and a few are colored people and Jews.

The good accomplished by the Phipps Institute may be put under three heads: the good to the physicians, the good to the patients, and the good to the public at large, accruing from the study, treatment, and prevention of tuberculosis. In the study of tuberculosis the physician derives his benefit, first from the examination of the case, and particularly from the fact that the examination must be complete, thereby rendering him more thorough in his work; second, from the confirmation or non-confirmation of his examination findings at autopsy; and third, from the weekly staff meetings which average more than twenty men out of the staff of thirty-two, at which cases and theoretical questions are discussed and to which uncommon or difficult cases and pathological specimens are brought.

The benefit to the patients lies in the amount of improvement produced, the care taken of them while they are very ill, and the prevention of contagion in other members of the family.

Since the hospital is intended for advanced cases, and since according to our statistics only advanced cases are admitted, it is readily intelligible that our results would not appeal to a layman on account of the number of patients who die. To physicians, however, this is perfectly natural and from our standpoint what is remarkable is not the number who die because that was to be expected, but the number that not only improve but improve sufficiently to go back to light work for one or more years.

The following are the statistics of the results of treatment of cases in the Phipps Institute that remained in the hospital or came to the dispensary over a period of three months for the year ending February, 1907:

	HOUSE.	DISPENSARY.
Incipient arrested	..	6 (16.22%)
" improved	..	27 (72.97%)
" unimproved	..	4 (10.81%)
" died	..	..
Moderately advanced arrested	..	..
" " improved	6 (50%)	53 (67.09%)
" " unimproved	2 (16.66%)	22 (27.84%)
" " died	4 (33.33%)	4 (5.06%)
Far advanced arrested	..	..
" " improved	18 (41.86%)	7 (35%)
" " unimproved	14 (32.55%)	9 (45%)
" " died	11 (25.58%)	4 (20%)
	55	136

The benefit to the public is in the general prevention of the disease: in the education of physicians to be capable of recognizing the disease in an early stage, and capable of treating it so as to insure cure if cure is possible; in the popular lectures which are given by the various members of the staff on request, either to popular societies, like labor and beneficial unions, or to medical societies; in the education of trained nurses in the care of tuberculosis, and in the running of tuberculosis dispensaries and sanatoria; and in the general diffusion of education by means of the annual report published in an edition of five thousand copies and distributed gratis.

A study of what is being accomplished in the way of the prevention of tuberculosis, published in the Third Annual Report, was entitled "A Statistical Study of the Influence of the Henry Phipps Institute upon the death-rate in Philadelphia." This statistical study was made of all the wards in the city of Philadelphia, and it was found that all the wards in which tuberculosis dispensaries or hospitals were located showed a definite decrease in tuberculosis, which was above the legitimate decrease taking place almost everywhere. The largest decrease in the city of Philadelphia was found in the wards in which the Phipps Institute does the greatest amount of its work, despite the fact that these are the slum wards of the city. The only wards which showed a definite increase in tuberculosis during the past three years were the fashionable wards in which the wealthy people live.

The fact that every ward in which a tuberculosis institution exists has had a reduction in the death-rate from tuberculosis is very interesting in view of the opposition which exists to the establishment of institutions for the treatment of tuberculosis on the score of danger to the neighborhood. There was the strongest opposition to the location of the Rush Hospital in the twenty-fourth ward. The twenty-fourth ward shows a reduction in the death rate from tuberculosis while its neighbor, the thirty-fourth ward, with exactly the same kind of a population, has had an increase.

Another very interesting fact is that the reduction in the death-rate from tuberculosis during the three years is among the poor in the crowded parts of Philadelphia rather than among the well-to-do in the sparsely built up parts of the city. The greatest reduction has been in the slum district, the foreign district, the colored district, and the manufacturing districts. These are just the parts of Philadelphia in which tuberculosis was most rife formerly. The wards in which the wealthy and the well-to-do live either have had an increase in tuberculosis or very little decrease. A corollary springs from these facts that the superficial instruction given to the wealthy and well-to-do for the prevention of tuberculosis as advocated by many is insufficient for the prevention of tuberculosis.

One of the things at the Phipps Institute that we are proudest of and would not be without is our training school of nurses.

When the institute first opened we were forced to take any nurse that we could get, and the majority of these knew little or nothing about the care of the tuberculous. Moreover many of them were afraid of tuberculosis and accepted positions simply because they were out of a position at the time. The inauguration of our own training school was a great venture since we put into it only cured tuberculous cases. Practically all of these tuberculous cases came from the White Haven Sanatorium. We consider our training school a great success and it is a success for probably the following reasons: first,

even when the girls enter they are already pretty well trained in the care of the tuberculous on account of the knowledge received in the cure of their own case; second, having gotten over tuberculosis themselves, they are not at all afraid of it; third, they are not disgusted by the unpleasant features of tuberculosis, namely, the expectoration, etc.; fourth, on account of their own cure, they are extremely enthusiastic about the cure of others, and having seen quite advanced cases recover they are never ready to give up hope; fifth, they are a constant source of encouragement to the patients who have thus constantly before them an example of cured tuberculosis.

The training school has been opened three years. So far we have taken in thirty-five girls of whom eighteen have graduated and have lucrative positions outside. Of the thirty-five, five have broken down.

It is commonly thought that our nurses must have been very early cases of tuberculosis. This is not at all true. The majority of our nurses were moderately advanced cases of tuberculosis. A small number were early cases and a few far advanced. One of the nurses at present in our training school has a cavity at the top of each lung, has moist râles all over both lungs, and was for two years absolutely confined to bed. Another of our nurses came into the Phipps Institute in a far advanced stage and successfully graduated in our training school this fall. I have gone into this question of nurses rather extensively because the most important essential of a tuberculosis dispensary is a well trained nurse.

There are two ways of running a tuberculosis dispensary, namely, like the Phipps Institute dispensary or the German dispensaries. The Phipps Institute dispensary is devoted more to the study and the German dispensary more to the treatment of the cases. The Phipps Institute dispensary treats a small number of patients, the German dispensary a large number. In the Phipps Institute dispensary a physician does everything in connection with a case except visit it; he takes the complete history, makes the complete examination, weighs the financial condition, gives instructions, etc., etc. In the German dispensary the nurse takes the history, judges the financial circumstances, and gives the instructions, the physician deciding only on the diagnosis. I think there are good arguments for both classes of dispensaries. Where the amount of funds is limited I think the arguments favor the Phipps Institute method since the patient is not only treated but the physician is further educated. In the German dispensary there is practically no lack of funds on account of the backing by either the insurance companies or the government.

PROCEEDINGS OF SOCIETIES.

THE JOHNS HOPKINS MEDICAL SOCIETY.

March 2, 1908.

Meeting of the Johns Hopkins Hospital Medical Society, Dr. Finney presiding.

I. A Case of Gas-cyst of the Intestine. DR. FINNEY.

The case was that of a man, between 60 and 70 years of age, who sought surgical advice because of his having lost more than one-half of his weight within a comparatively short time. For the past year he had suffered digestive disturbances that had gradually grown worse. When first seen he was vomiting everything that he ate, and at times the vomitus included food taken 24 or 48 hours previously, showing obstruction at the pylorus. He had vomited blood. Since his gastric juice contained no free hydrochloric acid and because of other symptoms, a diagnosis of carcinoma of the pylorus was made.

To relieve the obstruction a gastro-enterostomy was performed. The operation revealed cancer of the pylorus that involved the upper portion of the duodenum and the lower part of the stomach, as well as the retroperitoneal glands.

Springing from the free border of the ileum, near the ileocæcal valve, and fitting collar-like around the intestine for a distance of about 8 inches, was a peculiar soft mass or tumor, which extended up pouch-like from the ileum. This mass was made up of many thousands of little blebs that on cross section looked like bubbles or soapsuds, innumerable bubbles, pressed so closely together that they were facetted. At the base of the tumor along the intestine there was more fibrous tissue than elsewhere. Here and there were rather old hæmorrhages—about a dozen or more. The size of the blebs ranged from that of a small grape to a point just within range of vision.

The picture was more that of an echinococcus cyst than anything else. When cut into it was evident that the cysts contained air under so much tension that they popped. The gas did not burn. There were no bacteria in the cysts, which were lined by endothelium and supported by a delicate fibrous tissue framework. Giant cells, some necrosis, and endarteritis obliterans of the vessels were also to be made out. The giant cells formed in the endothelium.

The literature contains very few references to gas-cysts. Mayer of Bonn, in 1825, reported finding cysts containing nothing but air, in the pig's intestine. Since then these have frequently been observed in healthy pigs. In 1867 Winckel first noted a similar condition in man. Including the case presented by the author there have been in all eight instances of the gas-cyst of the intestine reported as occurring in man, only two of which were noted in the living subject.

DISCUSSION.

DR. WELCH stated that when working with the *B. aerogenes capsulatus* some years ago he became interested in these cysts, but he was left in doubt whether this organism caused the cysts. Gas-cysts of the brain have quite a literature: here they are due to the gas bacillus. He did not think that Dr.

Finney's case could be interpreted as a *B. aerogenes capsulatus* cyst, since microscopic sections showed some very remarkable polyhedral cells with curious honeycombed, vacuolar appearances that seemed characteristic. Mayer, he said, regards these as tumors and the gas as secretion; and there seems a priori at least no reason why we could not imagine cells occurring, which secrete gas. Nevertheless, it is hard to see why the gas remains and is not absorbed.

II. Splenectomy, with a Report of Six Cases. Dr. George Ben Johnston, Richmond, Va.

This paper embraced a statistical summary of all cases of splenectomy, reported prior to 1908; together with an account of six cases operated upon by the author.

Bardeleben's demonstration that the spleen might be removed without appreciable loss to the animal economy led to the operation as indicated in the occurrence of pathological changes, injuries and wounds. Vulpian summed up the changes resultant on splenectomy as follows: (1) a transient decrease in the red blood count and an increase in the white blood count; (2) the thyroid gland cannot assume the function of the spleen; (3) the lymph glands and bone marrow show increased activity; (4) the regeneration of blood is probably less rapid than normal. Some patients complain of pain in the bones, while others show an enlargement of the thyroid.

In his statistical study of splenectomy the speaker tabulated the lesions for which the operation was performed under 13 headings: idiopathic hypertrophy, ectopic spleen, ectopic spleen with twisted pedicle, malarial hypertrophy, ectopic malarial spleen, ectopic malarial spleen with torsion, splenic anæmia (Banti's disease), cysts of the spleen, leukæmia, tuberculosis, sarcoma, abscess, and miscellaneous affections. He divided all cases under three headings: those reported before 1890, those between 1890 and 1900, and those from 1900 to 1908.

(1) Idiopathic hypertrophy.—It is most probable that this condition results from some past infection, latent malaria, syphilis, etc. The indications for removal are usually prophylactic against subsequent possible rupture. The results are: prior to 1890, 18 cases with 11 deaths; 1890 to 1900, 15 cases with 2 deaths; 1900 to 1908, 41 cases with 8 deaths.

(2) Ectopic spleen.—The cause may be congenital (in rare instances), but it is usually an enlargement that produces relaxation of the suspensory ligaments. The indications for removal are, danger of torsion of the pedicle and the subjective symptoms on account of pressure. The results are: prior to 1890, 17 operations with 3 deaths; 1890 to 1900, 28 cases with 2 deaths; 1900 to 1908, 14 cases with 1 death.

(3) Ectopic spleen with torsion of the pedicle.—Operation is imperative. It is usually possible to make out the tense and tender spleen. The results are: prior to 1890, 5 cases with 4 deaths; 1890 to 1900, 11 cases with 4 deaths; 1900 to 1908, 11 cases with no death.

(4) Malarial hypertrophy.—The indications for operation are increased size, increased mobility, the tendency to rupture and danger of torsion of the pedicle, anæmia and cachexia make the prognosis grave. The results are: before 1890, 24 cases with 15 deaths; 1890 to 1900, 64 cases with 15 deaths; 1900 to 1908, 58 cases with 8 deaths.

(5) Ectopic malarial spleen.—The mortality is very low. Before 1890 there were 11 cases with no death; 1890 to 1900, 15 cases with 1 death; 1900-1908, 14 cases with no death.

(6) Ectopic malarial spleen with torsion of the pedicle.—Before 1890, 2 cases with 1 death; 1890 to 1900, 3 cases with 1 death; 1900 to 1908, 7 cases with 1 death.

(7) Splenic anæmia (Banti's disease).—This classification includes those cases of enlargement of the spleen with anæmia and without a history of malaria or general glandular enlargement. Two cases operated upon by Cushing and by Warren are well after 8 and $6\frac{1}{2}$ years respectively. The results are: before 1890, 12 cases with 5 deaths; 1890 to 1900, 18 cases with 4 deaths; 1900 to 1908, 25 cases with 3 deaths.

(8) Cysts.—These may be non-parasitic, hydatid, which are the most common, and dermoid, of which only one instance has been reported. The results of excision for hydatid cyst are: before 1890, 5 cases with 3 deaths; 1890 to 1900, 10 cases with 1 death; 1900 to 1908, 8 cases with no death. For non-parasitic cysts there were, before 1890, 4 removals with no death; 1890 to 1900, 3 removals with no death; 1900 to 1908, 6 removals with no death.

(9) Leukæmia.—In this affection splenectomy is definitely contraindicated. There have been 48 cases with 44 deaths.

(10) Tuberculosis.—There are several cases on record where the spleen was removed with the subsequent entire recovery of the patient. The condition is hardly ever primary. Before 1890 there was 1 removal with no death; 1900 to 1908, 3 removals with no death.

(11) Sarcoma.—There have been 11 cases reported with 3 deaths.

(12) Abscess.—This condition is always secondary. Surgical treatment is always indicated; and incision and drainage is the operation of choice. There have been 9 splenectomies with 1 death.

(13) Miscellaneous conditions.—Under this head the speaker grouped 5 splenectomies for pseudoleukæmia with 1 death, 1 successful operation for infantile splenic anæmia, 4 operations for benign growths with 1 death, 1 successful removal for echinococcus cyst, and 1 excision for aneurysm of the splenic artery. Under injuries he grouped spontaneous ruptures and crushing accidents. Immediate operation is imperative after rupture: the statistics are, 67 operations with 29 deaths. If the spleen suffers a penetrating wound, operation should be performed if the injury is multiple: for such wounds there have been 13 removals with 4 deaths. The cases that include all trauma number 150 splenectomies with 51 deaths.

Of Dr. Johnston's own 6 cases, 5 terminated in recovery. The fatal case was one of leukæmia.

Discussion.

Dr. Hunner expressed the society's indebtedness to Dr. Johnston and stated that in the gynæcological service of the Johns Hopkins Hospital there have been, in 13,000 admis-

sions, 5 cases of splenectomy and 1 case of partial excision of a blood cyst of the spleen. Of the 5 cases 2 were diagnosed before operation as multilocular ovarian cystoma, especially as they were wedged in the pelvis. One case was first diagnosed myoma uteri, although the possibility of a misplaced kidney was thought of. Only two of the five cases were diagnosed. In all there was a history of malaria.

DR. CUSHING recalled having removed 2 spleens for splenic anæmia. In both cases the most marked symptom was hæmatemesis. In the first case the diagnosis was gastric ulcer: no ulcer was found, but a very large spleen was removed. In the second case, Dr. Osler thought the hæmatemesis was due to some disturbance of the gastro-splenic vessels. Although this patient gained rapidly and the wound healed, he died 2 weeks after the operation from a sudden attack of hæmatemesis. Autopsy revealed extensive oesophageal varices, but there was no lesion of the stomach.

March 16, 1908.

Meeting of the Johns Hopkins Hospital Medical Society, Dr. Norton presiding in the absence of the president, Dr. Finney.

I. The Kern-plasma Relation Theory. DR. HOWARD, Cleveland, Ohio (see 2d article in this number).

DISCUSSION.

DR. WELCH considered work along the lines discussed by Dr. Howard to be of the highest importance as possibly being able to shed light on the structure and function of cells. He thought it still doubtful whether the chromidial network in the protoplasm is to be interpreted as being of nuclear origin, although it takes the nuclear stain. If nuclei are developed in chromidin nuclear cytoplasm, the event would be of extraordinary scientific value: it would make us think of giant cells where we can see no nuclear division. Dr. Howard's studies on pigmentation, he thought, opened up very suggestive lines of work. It is likely that the pigmentation in heart muscle is of nuclear origin. These studies might apply, perhaps, to regressive processes. We are familiar with giant nuclei in degenerations, with overgrowth of nuclei in atrophied fat and in degenerated atrophied muscle fibers. They may also throw a good deal of light on many of the mysterious inclusions in cells, particularly the Plimmer bodies.

DR. HOWARD replied that he thought that Schaudinn had made a very clear case that chromidin is nuclear material. It stains exactly like it and undergoes division; not, however, mitotic division. In spore formation a certain amount of this material goes into the new spores.

II. Studies on the Circulation. DR. P. M. DAWSON, DR. R. P. HIGGINS, and MR. L. W. GORHAM.

There is good reason for supposing that under normal circumstances the pulse pressure may be regarded as an index of the systolic output. It was, however, surmised that extreme variations in the mean blood pressure might disturb the parallelism between these two phenomena. Accordingly Dawson, at first alone and later in company with Gorham, performed experiments in which the pulse pressure and the systolic output were carefully compared. The former was determined by means of the Hurthle manometer; the latter by the use of a plethysmograph. The results obtained seemed to them to justify the following conclusion: Under normal conditions and during various procedures (namely; stimulation of the vagus centrally and peripherally, of the saphenus nerve centrally and of the annulus Vieussentis, and also during intravenous infusion of NaCl 0.7 per cent, intra-arterial infusion of strong sodium carbonate, bleeding and asphyxia) the pulse pressure remains a reliable index of the output of the heart per systole.

Extensibility and elasticity should not be confused. In a perfectly elastic body each is the reciprocal of the other. The extensibility of the excised arteries is determined by applying to them a stretching force and noting the increase in length of the piece of artery under examination; the distensibility, by applying pressure to the internal surface of a closed cylinder of artery and noting the change in the volume of the cylinder. Among those who have made studies of this kind is MacWilliam, who called attention to the fact that the excised arteries exist in either the contracted or the relaxed condition and that the curves of distensibility and extensibility differ in the two cases. He found that in the relaxed artery both distensibility and extensibility diminished as the distension or stretching proceeded. In the case of the contracted artery, the distensibility showed at first an increase and then a decrease and the same was true of transverse extensibility. But in the case of longitudinal extensibility a curve similar to that of the relaxed artery was obtained.

Higgins now confirms most of MacWilliam's results but differs from him in two respects. (1) He finds that the longitudinal extension of arteries in the contracted state at first increases and then decreases; that is, the same curve is obtained as in the case of the distensibility. (2) He regards the contracted state as a form of rigor mortis while MacWilliam regards it as the normal condition of the healthy artery.

With the object of determining the conditions actually present in the living animal, Dawson and Gorham made determinations of the velocity of transmission of the pulse wave in anæsthetised dogs in which the blood pressure was simultaneously caused to vary to a considerable extent. In this way it was hoped that a definite relation would be detected between the mean pressure and the velocity of the transmission of the pulse. For, since the velocity varies with the elasticity, the relation of the distension of the vessels to the distensibility (or in other words the variations in arterial elasticity and extensibility for varying arterial pressure) might thus be determined indirectly. The experiments, however, yielded unlooked for results, for it was found that owing probably to changes in the tone and caliber of the arteries the velocity of transmission of the pulse shows variations which are often independent of the mean blood pressure (and pulse pressure); that is, of the distending force.

NOTES ON NEW BOOKS.

Obstetrics. A Text-Book for the Use of Students and Practitioners. Second edition. By J. Whitridge Williams, Professor of Obstetrics, Johns Hopkins University; Obstetrician-in-chief to the Johns Hopkins Hospital, etc. With 16 plates and 666 illustrations in the text. (*New York and London: D. Appleton & Co., 1908.*)

Four years ago we took great pleasure in reviewing the first edition of this text which, on account of presentation of the pathology, the sound teaching of its extensive subject matter, its unusual bibliography, and pleasing manner of presentation was destined in our belief to be a standard text for students interested in scientific medicine. Naturally, therefore, we have awaited the appearance of the second edition with some impatience, while some other obstetrical texts of comparative age have passed through new editions, necessitated in our judgment only by a much needed revision of their faulty pathology.

We must confess that we received this new edition for review under the impression that it contained comparatively few changes. Much to our surprise, therefore, we found that practically the entire work has been revised and changed, and additions made to nearly every chapter. The subjects of the greatest interest in the obstetrical world at the present time have been entirely rewritten. Especially is this true of the chapters on the toxæmia of pregnancy, which now presents no points of resemblance to the older article. During the last few years this subject has been one of great interest to the Baltimore school, due in large measure to the brilliant and stimulating work of Slemons on the metabolism of normal and pathological pregnancies. As is well known from his recent articles, Dr. Williams would differentiate three types of pernicious vomiting of pregnancy; namely, reflex, neurotic, and toxæmic. He takes the view that the two former types can be readily cured, whereas in the latter variety the pregnancy must be terminated before organic lesions supervene which may be so pronounced as to be incompatible with recovery. Much, therefore, depends upon the differential diagnosis, which according to the author can be made only by the ammonia coefficient, which in the toxæmic variety exceeds 10 per cent. This view has evoked a flood of discussion from many who are quite incompetent to discuss the subject, as well as some who have done work in this field yet believe that undue importance is attached to a subject dependent upon as many variable factors as ammonia in the urine. Be that as it may, the fact remains that the reasons for Dr. Williams' belief are stated in the text in an extremely clear manner, and even if future work shows that the bottom of this blind subject has not been reached, the scientific world will still be under many obligations to Drs. Williams and Slemons for their stimulating work. The chapter on eclampsia is in effect a monograph as complete as could be desired.

The chapters on the development of the ovum have also been entirely rewritten, and this subject, once the despair of the medical student, now reads as an interesting novel. Waldeyer's recent investigation of the development of the ovary is taken as a basis, and the development of the fœtal membranes is considered in the light of the newer studies in the embryology of the higher mammals, which tend to substantiate the view that the amnion in man is formed as a result of the "inversion" of germ layers. These chapters, together with those of placentation, present a refreshing contrast to the usual descriptions noted in the average text.

In the discussion of the mechanism of labor, Sellheim's very recent theory is given which promises to revolutionize our former conceptions.

We note with pleasure that Dr. Williams inclines more to the necessity of actual measurements of the pelvic *canal* than in the former volume. Personally we believe that much harm has been done by teaching that much information concerning the pelvic canal can be obtained by the usual external measurements. In our opinion, actual measurements should be made in *all* cases, and the student taught that he is culpable unless the diagonal conjugate, and the anterio-posterior and transverse diameters of the outlet are taken as a routine, after the pelvis has been carefully palpated. In the present edition, Klien's work, which has added so much to our knowledge of contractions of the outlet, is considered and given the attention which it deserves.

Viewed from the practical side, many important features of the new edition are found in the chapters on the treatment of contracted pelvis. Careful reading of these articles shows that the author has modified his view as to the advisability of performing cæsarean section late in labor, as he now states that the results rapidly become worse the later it is performed, thus agreeing with the majority of American obstetricians. Yet the fundamentals of his treatment of "border line" cases remain unchanged, and are based upon the fact that upward of 60 per cent of such cases will be delivered spontaneously if they are given the opportunity, although the fœtal mortality increases so rapidly with the degree of pelvic contraction that it must be taken into consideration. Therefore, if all border line cases are subjected to primary cæsarean section, as unfortunately is the present tendency, a very large proportion of cases will be needlessly subjected to a serious operation. For these reasons the author has largely substituted pubiotomy for the cæsarean in the class of cases which he would first try by the second stage in the hope that labor may progress spontaneously, believing that the results will be less serious than by the older method. The statistics which he adduces are favorable to pubiotomy, although since these chapters went to press other less favorable reports have appeared in the literature. As yet the author has found no use for the induction of labor in this class of cases, which we believe has a most valuable field.

So much discussion has arisen in this country concerning certain phases of the treatment formerly advised in this text for this class of cases, that we can not refrain from certain comments. Although we are friendly neither to the late cæsarean, nor to pubiotomy as elective measures, it does appear to us that the numerous opponents of the expectant plan of treatment advocated by the author have evaded a fundamental point, as it does not follow that the total mortality of cases of labor in contracted pelvis will be more in the expectant than in the elective plan of treatment, even though it is granted that the mortality of cæsareans during the second stage greatly exceeds that of those performed before the onset of labor. Fewer cases will be subjected to serious major operations in the expectant than in the elective plan, and therefore it is just as useless to compare the results of cæsareans during the second stage of labor with those before the onset, as to compare the ultimate results of cervical cancer in the services of men who operate upon only 10 per cent of cases with those who treat a much larger number. The fact that Dr. Williams would substitute pubiotomy for the late cæsareans does not alter the fact that he is encouraging conservative treatment by selecting cases, which would be even more conservative if the premature induction of labor were advised in proper cases. The truth as to the best way of treating labors in contracted pelvis can be ascertained eventually only by the comparison of large series which include *all* the cases of contracted pelvis treated in various clinics, divided into groups according to the method in which delivery was effected, together with their maternal and fœtal mortality.

The text indicates that the author would wisely restrict the employment of accouchment forcé, advising vaginal hysterotomy

in its stead for rapidly terminating pregnancy when indicated, in all cases in which the cervix is undilated and rigid.

In all other sections is the work also brought up to date, the additions necessitating an increase in the number of illustrations, plates and pages.

This volume has been most difficult to review, largely due to the fact that the most important chapters are in effect monographs, which constantly tempt one to discuss them from that standpoint, and make him forgetful that the work is designed for students and practitioners rather than teachers. Yet from any standpoint the edition is a distinct and valuable contribution to medical science, combining as it does safe teaching and scientific accuracy with a rare literary style. FRANK W. LYNCH.

First and Second Interim Reports of the Royal Commission appointed to Inquire into the Relations of Human and Animal Tuberculosis. (London: Printed for His Majesty's Stationery Office, by Wyman & Sons, Limited, Fetter Lane, E. C. 1904-1907.)

Following Professor Robert Koch's famous address before The British Congress on Tuberculosis on July 23, 1901, the King of England appointed on the 31st day of August, 1901, a Royal Commission consisting of Sir Michael Foster, Dr. German Sims Woodhead, Dr. Sidney Harris Cox Martin, Prof. John McFadyean and Prof. Rubert William Boyce to inquire and report with respect to tuberculosis: 1. Whether the disease in animals and man is one and the same; 2. Whether animals and man can be reciprocally infected with it; 3. Under what conditions, if at all, the transmission of the disease from animals to man takes place, and what are the circumstances favorable or unfavorable to such transmission.

This commission thus appointed immediately prepared to consider an answer to these questions by making a series of experiments upon animals, and through the generosity of Sir James Blyth was placed in control of two farms with farm buildings and other accommodations for the investigation of the problems at Stansted about half way between London and Cambridge.

On the 16th of May, 1904, the commission made its first interim report, a little pamphlet of four leaves without cover. In this report, the commission says: "The results which we have thus obtained are so striking, that we feel it our duty to make them known, without further delay, ... for the reason that the result at which we have arrived; namely, that tubercle of human origin can give rise in the bovine animal to tuberculosis identical with ordinary bovine tuberculosis, seems to us to show quite clearly that it would be most unwise to frame or modify legislative measures in accordance with the view that human and bovine tubercle bacilli are specifically different from each other, and that the disease caused by the one is a wholly different thing from the disease caused by the other."

Following up the line of work already begun and thus reported upon in the First Interim Report, in January, 1907, the commission issued its Second Interim Report with a detailed statement of all the investigations completed up to that date. The whole comprises six full quarto volumes consisting of about 2600 pages. The care and accuracy with which the details of each line of investigation have been made make the report well worthy of the highest consideration.

The work upon the Pathogenic Effects of Bovine Viruses has been done mainly by Dr. A. Stanley Griffith. The work upon the Pathogenic Effects of Human Viruses by Dr. Louis Cobbett. The volume on the "Comparative Histological and Bacteriological Investigations," by Dr. Arthur Eastwood.

A few quotations as to the bearings of the results arrived at will be interesting, and these conclusions are based not only upon the most careful observations of the men whose names have just been quoted, but have been carefully investigated in every instance by the commission itself, and, therefore, are entitled to great weight. The report says:

"There can be no doubt but that in a certain number of cases the tuberculosis occurring in the human subject, especially in children, is the direct result of the introduction into the human body of the bacillus of bovine tuberculosis; and there also can be no doubt that in the majority at least of these cases the bacillus is introduced through cows' milk. Cows' milk containing bovine tubercle bacilli is clearly a cause of tuberculosis and of fatal tuberculosis in man.

"Of the 60 cases of human tuberculosis investigated by us, 14 of the viruses belonged to Group 1, that is to say, contained the bovine bacillus. If, instead of taking all these 60 cases, we confine ourselves to cases of tuberculosis in which the bacilli were apparently introduced into the body by way of the alimentary canal, the proportion of Group 1 becomes very much larger. Of the total 60 cases investigated by us, 28 possessed clinical histories indicating that in them the bacillus was introduced through the alimentary canal. Of these 13 belong to Group 1 (*i. e.*, contained the bovine bacillus). Of the nine cases in which cervical glands were studied by us, three, and of the 19 cases in which the lesions of abdominal tuberculosis were studied by us, 10 belong to Group 1 (*i. e.*, contained the bovine bacillus).

"These facts indicate that a very large proportion of tuberculosis contracted by ingestion is due to tubercle bacilli of bovine source.

"A very considerable amount of disease and loss of life, especially among the young, must be attributed to the consumption of cows' milk containing tubercle bacilli. The presence of tubercle bacilli in cows' milk can be detected, though with some difficulty, if the proper means be adopted, and such milk ought never to be used. There is far less difficulty in recognizing clinically that a cow is distinctly suffering from tuberculosis, in which case she may be yielding tuberculous milk. The milk coming from such a cow ought not to form part of human food, and indeed ought not to be used as food at all.

"Our results clearly point to the necessity of measures more stringent than those at present enforced being taken to prevent the sale or the consumption of such milk."

Such conclusions as these, reached after such careful and comprehensive investigations as the report indicates, must command our respectful attention and warn us to remit in no degree our efforts to secure milk, especially for infants, from cows proven by the tuberculin test to be frec of tuberculosis. H. B. J.

Thirty-fifth Annual Report of the Local Government Board, 1905-1906. Supplement in the Continuation of the Report of the Medical Officer for 1905-1906. "On Sanatoria for Consumption and Certain Other Aspects of the Tuberculosis Question." By H. TIMBRELL BULSTRODE, M. D. Price 10s. 2d. *(London: Printed for His Majesty's Stationery Office, by Darling & Son, Ltd., 34-40 Bacon St., E., 1908.)*

Attention is called to this comprehensive report of the tuberculosis question in Great Britain, a volume of 670 pages. No work which has recently appeared gives such a complete idea of the condition of the tuberculosis problem in any country as does this of Dr. Bulstrode's. The extent of the study may be gathered from the titles of certain of its chapters. Chapter II—"The Decline in the Death Rate of Pulmonary Tuberculosis in England." Chapter V—"The Prevalence of Tuberculosis in the Human Subject and the Evidence which such Prevalence affords of the Curability of the Disease." Chapter VII—"The Influence of Earlier Recognition and Better Treatment upon the Death Rate of the Malady." Chapter VIII—"The Evolution of the Sanatorium Idea." Chapter XII—"Immediate Results of Sanatorium Treatment."

Extremely interesting is Chapter II with its table showing the

steady decrease in the death rate from tuberculosis since the year 1853, a decline not much increased or altered apparently by the discovery of the tubercle bacillus, or the modern methods of prevention; a decline, too, if it were to persist in future years at the same rate would seem to indicate that within the memory of men now living tuberculosis would cease to be a factor in the death rate of Great Britain.

The latter part of the book is devoted particularly to the description of the sanatoria of the British Isles, and gives both by pictures and by full statements a very accurate idea of the kind of work being done in each one of them. England, particularly in the last two or three years, has had a very large increase in the number of its sanatoria, and as their statistics compare very favorably with the statistics in the sanatoria, which in earlier years were considered to be in the necessary climate, this report goes far toward disproving the value of climate per se as a factor in the curability of tuberculosis.

This report should have wide reading in this country as it represents the best type of work upon the subjects discussed.

H. B. J.

Diets in Tuberculosis, Principles and Economics. By Noel Dean Bardswell, M. D., etc., and John Ellis Chapman, M. R. C. S., etc. (*London: Henry Frowde*, and *Hodder & Stoughton.*) *Oxford Medical Publications.*

There has been of late years a general reaction against forced feeding in tuberculosis and a more reasonable groundwork sought for in prescribing diets to tuberculous patients. Bardswell and Chapman have contributed interesting observations to the question, and in their present publication have collected their previous work, and put it into a concise and instructive form. The book is plainly and interestingly written, and as it is not at all technical, it will prove of as great value to visiting nurses and social workers as to physicians. There is no problem these meet more important than the instruction of the poor in the most economical food they can buy and the most advantageous way they can prepare it. The object of the authors is to construct a standard diet that will be clinically efficient, that will be palatable and that will be economical. They accept as a normal physiological diet one that contains for each day 120 grammes of proteid and from 2500 to 5000 calories depending upon the amount of muscular work done. For a tuberculous patient the amount of proteid and the number of calories should be raised by about a third above what would be for them a normal diet. Their gain in weight and the clinical progress of their disease is then quite satisfactory and they are saved the digestive disturbances which are frequently so very distressing when forced feeding is practiced. An economical diet the authors conclude from studies of normal workingmen's diets, should not cost over 1 shilling, or 25 cents per day. They give a lengthy consideration of the cost and nutritive value of various articles of food and an interesting report upon the relative efficiency of animal and vegetable proteid. They were able to treat quite successfully early cases of pulmonary tuberculosis when the patients could take considerable exercise with absolutely meat-free diets. Advanced cases with fever and at rest must have their meals in a more concentrated form as their impaired digestion cannot cope with the large bulk of food it is necessary to take to get the required amount of proteid from vegetables. In the last chapter a diet table is given which was used in the Coppin's Green Sanitarium and which may be considered a standard. It contains 153.3 grammes of proteid and 3889 calories; its cost is 11.57 pence, or about 24 cents per patient per day; each cent buys 6.4 grammes of proteid and 162 calories; the diet is clinically efficient as the progress of the patients was most satisfactory. The book is liberally supplied with tables which make the information compact and are not so filled with detail as to be a task to unravel.

A Mind That Found Itself—An Autobiography. By Clifford Whittingham Beers. (*New York: Longmans, Green & Co., 1908.*)

The value of this work can be estimated justly by a few trained psychiatrists only, and for that reason it is regrettable that it should be read by the public at large. It is right that the public should be informed of all that Mr. Beers tells it, but the public will hesitate to believe that Mr. Beers' autobiography is credible. Mr. Beers was insane, and passed several years in both private and State hospitals for the insane in Connecticut. Of the years passed in these institutions, and what he saw, and how he suffered in them he has written fully, and by the student of mental disease this autobiography will be read with care. Mr. Beers has written the book with the purpose of arousing national interest in these asylums, and of effecting reforms in their internal administration. Many should doubtless be wiped off the face of the earth—they are horrible and a disgrace to our civilization—others, like all human institutions, could be improved, and a few are as nearly perfect as intelligence and kind-heartedness can make them. It would be a pity if the public were to get overexcited on this question—reforms cannot be accomplished of a sudden, and there is no doubt that each year sees improvements in the care of the mentally ill. It would be well if there was more State supervision of all institutions where this class of patients is cared for, but all know how evil State supervision often is where appointments are made for political reasons rather than on the ground of knowledge and capacity. Other similar autobiographies have been written, and the care of the insane has for years been discussed in our legislative bodies, and their care is, on the whole, as good as that of other dependent and irresponsible persons. Their care cannot be better than the intelligence of the communities in which they live accounts for. It is not simply either a question of intelligence, but one of finances. Many of those in charge of the insane are ignorant, many have not and cannot secure the means to carry out reforms they see the need of. Mr. Beers is to be praised for his frankness—it must have been even more painful to him to write his autobiography than it is for us to read it—and if he succeeds in securing any needed reform, the public will be most grateful to him, and hail him as a hero. Meanwhile, may the book be read only by the serious-minded, and not by those in search of a new sensation, no matter at what cost. It is most painful to think of any one reading this sorrowful revelation of a man's most intimate life, which most would desire to hide from all eyes, for mere amusement. For this reason it is desirable that the book should not have too wide a circulation, for much of it will be falsely interpreted, as it can only be understood by doctors, and therefore should only be in their hands. If it can assist in the establishment of psychopathic hospitals wherein patients can be treated and cured as in a general hospital, it will have accomplished great good.

R. N.

Diseases of the Breast with Special Reference to Cancer. By William L. Rodman, M. D., LL. D., Professor of Surgery in the Medico-Chirurgical College of Philadelphia, Professor of Surgery in the Womans Medical College of Pennsylvania, etc. With 69 plates, of which 12 are in colors, and 42 other illustrations. $4.00. (*Philadelphia: P. Blakiston's Son & Co., 1908.*)

In the first 172 pages the anatomy and the various diseases of the breast are briefly discussed, while the last 208 pages are taken up with the consideration of carcinoma. It is to be noted that Halsted's operation for cancer of the breast is not described among the others, although it is the one most frequently used, and, furthermore, is the original complete breast operation, and has been used by him as a routine measure since 1888.

Many authors are quoted throughout the book, but references to their original articles are few and far between.

The illustrations are good, although we have seen many of them before in the journals of the last few years.

There is little that is new or original in this treatise, which, on the whole, is quite superficial in its character, and practically nothing is added to the previous knowledge of diseases of the breast.

Life Insurance and General Practice. By E. M. BROCKBANK, M. D., etc. (*London: Henry Frowde, Hodder & Stoughton, 1908.*) *Oxford Medical Publications.*

This is an excellent manual for practitioners who are examiners of life insurance companies. Examinations made with the object of insuring lives require more than ordinary care and knowledge on the part of the doctor, who has oftentimes an extremely difficult rôle to play. In addition to the power of making a careful physical examination, the examiner must have the ability to look ahead, and weigh the chances of the probable duration of life of the applicant—no easy task oftentimes. He has rules to guide him, but, as is frequently said, rules are made to be broken, and he must know when he can do this with safety to the company for whom he is examiner, and with advantage to the proposer, the person insuring his or her life. Dr. Brockbank has divided his manual into two sections: 1st. The Medical Examination of an Applicant for Insurance; 2d. Impaired lives. Such a division necessarily involves a certain amount of repetition, but, on the whole, is a satisfactory manner of dealing with the subject of life insurance. The insuring of "impaired" lives is to-day one of the most important and difficult parts of life insurance work. A few years ago "impaired" lives were not accepted by most companies, but to-day only a few companies still refuse to accept these lives on some plan. The studies of risks have been many, and as a result many more lives more or less impaired can be safely accepted than heretofore. This is an immense advantage to the applicant, and it is by this liberality that the American companies have gone ahead with such strides. The meetings of insurance examiners both at home and abroad have brought about a better understanding of "risks" of all natures, and to-day there is a well-marked tendency on the part of almost all companies to accept all applicants who have at least a fair probability of, say, 10 years' life on some plan. The plan may be costly to the applicant, but it at least gives him a chance to insure himself if he so desires. Insurance for a healthy life for a limit of 10 years is expensive, so that for an impaired life it is still more so, but there are always some who are willing to pay the increased rates, and the rates for almost all classes and ages is diminishing. Dr. Brockbank's work can be recommended as a safe and reliable guide to all examiners of life insurance companies, and it will help them over many of the difficulties of their work. It is only to be wished that he had added a chapter on the relation of doctor and agent, and one on frauds, both important features in this branch of medicine. R. N.

Treatment of Internal Diseases, for Physicians and Students. By DR. NORBERT ORTNER, of the University of Vienna. Edited by NATHANIEL BOWDITCH POTTER, M. D., etc. Translated by FREDERIC H. BARTLETT, M. D. (*Philadelphia and London: J. B. Lippincott Company, 1908.*)

This volume, devoted to the treatment of internal diseases, will, we believe, prove a disappointment to American readers. As the editor remarks in his preface, "the profusion of prescriptions and the author's apparently perfect trust in so many drugs" is disappointing, and may prove, for the beginner at least, a source of considerable difficulty. Much of the text is excellent, but one is constantly struck with the overemphasis of the drug treatment, often to the neglect of simple but equally or more important hygienic measures.

It is gratifying to find only surgical treatment of gastric carcinoma discussed, emphasis being laid on the importance of early diagnosis, while the medical treatment which follows is solely for inoperable cases. The author's experience with the surgical treatment of exophthalmic goiter does not coincide with the results obtained in the clinics of the most skilled American and European surgeons. The treatment of pernicious anæmia is surprisingly poor; arsenic is warmly recommended and transfusions of blood are said to be beneficial, though the author admits that in only two instances has he seen benefit derived from this procedure—and in both instances the patients were suffering from *secondary anæmia.* No reference is made to the value of rest in bed, fresh air, sunshine, etc.

Many valuable additions to the text have been made by the editor, but despite these the volume is not one which we feel should be recommended.

Abel's Laboratory Handbook of Bacteriology. Translated from the tenth German edition. By M. H. GORDON, M. D., etc. With additions by Dr. A. C. HOUSTON, DR. T. J. HORDER, and the Translator. Price, $1.50. (*London: Henry Frowde,* and *Hodder & Stoughton, 1907.*) *Oxford Medical Publications.*

The 10th edition of Abel's well-known book on bacteriological technique has been much enlarged and improved by the translator, M. H. Gordon, assisted by A. C. Houston and T. J. Horder. It contains clear, simple descriptions of the standard methods employed in bacteriology and can be heartily recommended to students as a convenient laboratory guide. Section XI, by Houston, is devoted especially to the consideration of the bacteriological examination of water, milk, shell-fish, etc., and is an important addition to the original, likely to prove of great service to students of sanitary bacteriology.

Atlas and Text-Book of Human Anatomy. Volume III—Completing the work. By Prof. J. SOBOTTA, of Wurzburg. Edited, with additions, by J. PLAYFAIR MCMURRICH, A. M., Ph. D., Professor of Anatomy at the University of Toronto, Canada. Quarto of 342 pages, containing 297 illustrations, mostly all in colors. Cloth, $6.00. (*Philadelphia and London: W. B. Saunders Company, 1907.*)

Volume III, Vascular System, Nerves, and Sense Organs, the last of the publication, proves a worthy successor of the two which have preceded it.

The illustrations, as in the former volumes, are realistic, and have lost nothing from the fact that the vessels and nerves appear, as in the subject, depicted together, though at times the vast amount of detail has led to unavoidable transposition of names, *e. g.*, on page 85, Fig. 588, left subclavian artery should read vein, and minor mistakes in letters, which the student will discover for himself.

The effort to emphasize the collateral circulation deserves special mention, even though it is at times diagrammatic; it is a great aid to the memory to realize through the picture the mechanism of this important provision in nature.

The minute detail of the lymphatic system is well worth particular attention, as that system is usually neglected by the average student, through the necessarily limited supply of material, and the apparently unimportant position of the system in minor surgery.

The nervous system and the eye and ear receive generous consideration, and by a series of really exquisite plates, these intricate organs are presented in a comprehensive way.

As before said, a review cannot do justice to this publication.

On page 125, fourth line from the top *fine* should read *find.*

Diagnostics of the Diseases of Children. By Le Grand Kerr, M. D. Cloth, $5.00. 542 pages with illustrations. (*Philadelphia: W. B. Saunders Company, 1907.*)

The subject of exact diagnosis has been attracting more attention of recent years than ever before, and this book is an effort to bring into one volume the numerous facts which relate to the diagnosis of disease in infants and children. It is a book which is much needed by the general practitioner and by others who have to do with children. It gives a thorough resumé of the methods of examination, as well as short accounts of the significance of various symptoms and of the more important diseases. It contains a number of original illustrations, and taken altogether should prove a very useful addition to any library. The publishers have done their part of the work well with the exception that the book is printed on very heavy paper which makes it larger and heavier than necessary.

American Practice of Surgery. Editors, Joseph D. Bryant, M. D., LL. D.; Albert A. Buck, M. D., of New York City. Complete in eight volumes. Profusely illustrated. Volume IV. (*New York: William Wood & Co., 1908.*)

In this volume the part on diseases and injuries of joints is concluded, and Parts 14 and 15 on operative surgery and orthopedic surgery complete the volume. The contributors are all men well known in the profession. It would seem more natural if in such a practice of surgery the part on operative surgery had been in the first volume, and it is a pity that parts are divided so as to appear in successive volumes. The work is, as stated, profusely illustrated, and as a result over-illustrated, but the quality of the illustrations is in large measure excellent. For the surgeons—the country practitioners—who are called upon to perform all sorts of operations and who have not the opportunity to see them constantly performed in the large cities by the most skilled operators, this system will prove serviceable, as it is full of detail. But a man will never become a skilful surgeon from reading any system of surgery—he must either be born with certain natural gifts or have the chance to practice surgery largely—so that it is doubtful how valuable such a system as the present one is, as the country practitioner had better operate only in emergency cases, and not be induced to do difficult operations, by the apparent simplicity of a picture and book description. This "Practice" can be safely recommended to all who can afford its purchase, for it is a useful and excellent guide. R. N.

A Practical Guide to the Examination of the Ear. By Selden Spencer, A. B., M. D. With an introductory chapter by H. N. Spencer, M. D., LL. D. 12 mo. 66 pages. (*St. Louis: C. V. Mosby Medical Book Publishing Company, 1908.*)

This little book is of an unusual character, purporting merely to present an outline sketch of the course in otology as it should be pursued by the undergraduate medical student. It points out briefly the methods of procedure in making aural examinations and suggests the points of practical importance in the study of the diseases affecting different portions of the organ. Several good and useful illustrations of the tympanic membrane and cavity are presented. H. O. R.

Burdett's Hospital and Charities, 1908. Being the Year Book of Philanthropy and the Hospital Annual. By Sir Henry Burdett, K. C. B., etc. Price 7/6 net. (*London: The Scientific Press, Limited.*)

Sir Henry Burdett's Annual has long been known and much appreciated by all interested in hospital administration. No one else has devoted so much time and study to all parts of this work, and his ability has been universally recognized. The volume grows in size annually and shows an immense amount of painstaking labor and industry in the compiling of numerous valuable tables. All administrative officers of hospitals owe him a deep debt of gratitude for his toil and efforts, which have brought about many much needed and important reforms in hospital government. In addition to the tables which appear annually in this volume, there are several short papers, which, though applying more especially to conditions existing in English hospitals, are nevertheless worth study in relation to American hospitals. A similar volume for the United States and Canada would be most serviceable, and it is to be hoped that before long some one may be willing to undertake this burdensome task, which has little recompense, except the personal satisfaction which comes from doing a tedious piece of work well. R. N.

Medical Gynecology. By Howard A. Kelly, M. D., etc. 8vo. 662 pp. 163 illustrations. (*New York: Appleton, 1908.*)

In this work Dr. Kelly has, with the assistance of several colleagues and members of his staff, presented very fully those phases of gynecological practice which come within the scope of the general practitioner. The subjects of hygiene and prophylaxis are most carefully considered, and these chapters must prove specially valuable to those who have the care of growing girls and young women.

Diagnosis is presented very clearly, and it is here particularly that the admirable drawings by Messrs. Brödel and Horn are of the greatest value, supplementing and making clear what the most careful description leaves indistinct and confusing to one not specially trained in this field.

Dr. Barker contributes an excellent chapter on the functional nervous diseases met with by the gynecologist which fills a place hitherto rather neglected by the authors of text-books in this branch of surgery.

The venereal infections are handled very broadly, and the important questions as to marriage, heredity, and sterility carefully considered.

Treatment is given a large share of consideration, and all the modern methods of mechanical and electric therapy are brought to bear as well as the best of the old and new in drug treatment.

Altogether the book is a very acceptable addition to the working library of the physician and student. T. R. B.

International Clinics. Vol. I. 18th series. 1908. (*J. B. Lippincott Company, 1908.*)

In addition to the usual number of papers, 19 in number, in this volume, on treatment, medicine, surgery, gynecology, neurology, and pathology, there are three long reviews on the "Progress of Medicine During 1907." The first of these is on "Treatment," by Dr. A. A. Stevens; the second on "Medicine," by Drs. D. L. Edsall and V. Nesbet, and the third on "Surgery," by Dr. J. C. Bloodgood. The latter covers 50 pages, while the two other demand only about 30 each. It is doubtful, however, whether any fair estimate of the real progress in these branches could be drawn from these figures, but it is fair to state that to the general practitioner, the yearly advances in surgery are more apparent than those in medicine. The volume does not fall behind its predecessors in general interest—it contains various timely articles written by well-known men, and is abundantly illustrated. R. N.

An Aid to Materia Medica. By Robert H. M. Dawbarn, M. D., etc. Fourth edition, revised and enlarged by Eden V. Delphey, M. D. Price, $1.75. (*New York: The Macmillan Company, 1908.*)

This small volume is one of the best of its kind that we have seen. It is intended solely for those preparing for examinations and for physicians for quick reference. The text has been revised to conform with the recent edition of the pharmacopeia. Perhaps the best part of the book is the preface, in which the author gives

some very wholesome advice. We quote the following: "The writer, however, after 27 years as a physician, finds himself using a very limited range of drugs and believes it would be the part of wisdom for physicians to drop many which they are now using, to get thoroughly acquainted with a few drugs and not change to a new or much-lauded drug until he finds an indication which the old one fails to meet."

Medical Lectures and Aphorisms. By SAMUEL GEE, M. D., F. R. C. P., etc. (*London: Henry Frowde, and Hodder & Stoughton, 1908.*) *Oxford Medical Publications.*

This little volume of lectures, now in its third edition, well deserves the popularity it has attained. The essays are delightfully written and are teeming with clinical wisdom, the result of the author's long experience in hospital and private practice. No one essay can be singled out for commendation, they are all so good. One's only regret in reading this volume is that it is not larger. The aphorisms are for the most part well-known clinical facts and are well chosen.

Dr. Gee's work cannot be too highly recommended, we feel. The physician who reads it will be likely to be entertained as well as instructed.

The Animal Mind. A Text-Book of Comparative Psychology. By MARGARET FLOY WASHBURN, Associate Professor of Philosophy in Vassar College. 8vo. Cloth. 333 pp. Price, $1.60 net. (*New York: Macmillan, 1908.*)

This work is the second volume in The Animal Behavior Series, recently inaugurated with the publication of Yerkes' "Dancing Mouse." In the present work, the author sums up what is known concerning the neural and mental manifestations in the so-called lower animals, "as deduced from experimental evidence." The matter is considered from the standpoint of comparative rather than genetic psychology, and makes readily accessible a mass of scattered material which has been accumulating in a new, most difficult, and most important field of investigation.

The crux in animal psychology is the phenomenon of consciousness. The author refutes the argument of those who would limit this quality to human beings, and shows also the fallacy committed by certain observers who seek to establish definite criteria which shall make it possible to draw a line between animals with mind and those without, constantly taking account, however, of the dangers of the *psychologists' fallacy.* "We know not when consciousness begins in the animal world. We know where it surely resides—in ourselves; we know where it exists beyond a reasonable doubt—in those animals of structure resembling ours which rapidly adapt themselves to the lessons of experience. Beyond this point, for all we know, it may exist in simpler and simpler forms, until we reach the very lowest of living beings."

The author discusses in order the various sensory discriminations, space perception, habit, memory, and attention, beginning in each case with the lowest animals and tracing analogous qualities through the ascending scale, in so far as the experimental method has hitherto supplied evidence.

The bibliography contains a list of 476 works, and the fact that only about 15 per cent of these appeared previous to 1890, indicates the great activity in comparative psychology which recent years have witnessed.

In general make-up the book is satisfactory. FARRAR.

Rotunda Midwifery for Nurses and Midwives. By G. T. WRENCH, M. D. (*London: Henry Frowde, and Hodder & Stoughton, 1908.*) *Oxford Medical Publications.*

As the author states in his preface, the average nurse or midwife has difficulty in understanding the manuals provided for her. On this account he has endeavored to produce a book which shall embrace the essentials in midwifery, but in such language as to be intelligible to all, therefore he has used as few technical terms as possible, and where these are necessary, their derivation and definition is clearly given.

The book is based on the method of teaching midwifery at the Rotunda Hospital and is made to conform to the requirements of the Central Midwifery Board of England.

On the whole, the arrangement and mode of treating the subject is good; this is especially true in regard to the advice given for the recognition of abnormalities and the necessity of obtaining medical assistance in such cases.

For the beginner in the study of obstetrics this book should be quite useful.

BOOKS RECEIVED.

Medical Gynecology. By Howard A. Kelly, A. B., M. D., LL. D., F. R. C. S. (Hon. Edinb.). With 163 illustrations, for the most part by Max Broedel and A. Horn. 1908. 8vo. 662 pages. D. Appleton & Co., New York and London.

Coming Motherhood. Practical Suggestions Relating to Maternity and the Care of Infants and Children. By Louis A. Spaeth, M. D. 1907. 12mo. 93 pages. Peter Reilly, Philadelphia.

Diets in Tuberculosis. Principles and Economics. By Noel Dean Bardswell, M. D., M. R. C. P., F. R. S. (Edin.) and John Ellis Chapman, M. R. C. S., L. R. C. P. 1908. 12mo. 184 pages. Henry Frowde, London; Hodder & Stoughton, London. *Oxford Medical Publications.*

Cancer. Relief of Pain and Possible Cure. By Skene Keith, M. B., F. R. C. S., Ed., and George E. Keith, M. B., C. M. 1908. 12mo. 155 pages. The Macmillan Company, New York.

Diseases of the Heart and Aorta. By Thomas E. Satterthwaite, M. D. 1905. 8vo. 304 pages. E. R. Pelton, New York City.

American Practice of Surgery. A Complete System of the Science and Art of Surgery, by Representative Surgeons of the United States and Canada. Editors: Joseph D. Bryant, M. D., LL. D.; Albert Buck, M. D. Complete in eight volumes. Profusely illustrated. Volume IV. 1908. 4vo. 1010 pages. William Wood & Co., New York.

Board of Health of the State of New Jersey. Thirty-first annual report and annual report of the Bureau of Vital Statistics. 1907. 8vo. 432 pages. 1908. Trenton, New Jersey.

Hernia, Its Cause and Treatment. By R. W. Murray, F. R. C. S. 1908. 8vo. 99 pages. J. and A. Churchill, London.

The Border-Land of Epilepsy. Faints, Vagal Attacks, Vertigo, Migraine, Sleep Symptoms, and Their Treatment. By Sir William R. Gowers, M. D., F. R. C. P., F. R. S. 1907. 8vo. 121 pages. P. Blakiston's Son & Co., Philadelphia.

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CONTENTS.

	PAGE
The International Congress on Tuberculosis. Letter from President Roosevelt.	187
A Recent Visit to Some of the Medical Laboratories Abroad. By W. L. Moss, M. D.	188
Further Note on Mrs. Packard. By W. R. Dunton, Jr., M. D.	192
The Obstetrical Significance of the Blood Pressures and their Relation to the Work of the Heart. By J. Morris Slemons, M. D., and F. C. Goldsborough, M. D.	194
The Barred Road to Anatomy. By Howard A. Kelly, M. D.	196
Variations in the Calcium Content of the Blood following Therapeutic Measures. By Thos. R. Boggs, M. D.	201
Proceedings of Societies. The Johns Hopkins Medical Society.	203
Medical Education in the United States [Dr. Bevan];—The Early Diastolic Heart Sound (The So-called Third Heart Sound) [Dr. Thayer];—Intraventricular Systole [Dr. Stewart];—The Anatomy of the Conductive System in the Mammalian Heart [Dr. Retzer];—Demonstration of the Interventricular Muscle Bands of the Adult Human Heart [Dr. Knower].	
Notes on New Books.	209

THE INTERNATIONAL CONGRESS ON TUBERCULOSIS.

LETTER FROM PRESIDENT ROOSEVELT.

The White House, Washington, May 12, 1908.

To Dr. Lawrence F. Flick, Chairman, Committee on International Congress on Tuberculosis:

Sir:—It is with great pleasure that I accept the presidency of the "International Congress on Tuberculosis" which is to meet in this city September 21, 1908 and extend its session to October 12, 1908. Official duties, however, may prevent my presiding at the initial meeting of the Congress, in which case I will deputize Secretary Cortelyou.

The importance of the crusade against tuberculosis, in the interest of which this Congress convenes, cannot be overestimated when it is realized that tuberculosis costs our country two hundred thousand lives a year, and the entire world a million lives a year, besides constituting a most serious handicap to material progress, prosperity and happiness, and being an enormous expense to society, most often in those walks of life where the burden is least bearable.

Science has demonstrated that this disease can be stamped out, but the rapidity and completeness with which this can be accomplished depend upon the promptness with which the new doctrines about tuberculosis can be inculcated into the minds of the people and engrafted upon our customs, habits and laws. The presence in our midst of representatives of world wide workers in this magnificent cause gives an unusual opportunity for accelerating the educational part of the program.

The modern crusade against tuberculosis brings hope and bright prospects of recovery to hundreds and thousands of victims of the disease, who under old teachings were abandoned to despair. The work of this Congress will bring the results of the latest studies and investigations before the profession at large and place in the hands of our physicians all the newest and most approved methods of treating the disease—a knowledge which will add many years of valuable life to our people and will thereby increase our public wealth and happiness.

The International Congress on Tuberculosis is in the interest of universal peace. By joining in such a warfare against a common foe the peoples of the world are brought closer together and made to better realize the brotherhood of man; for a united interest against a common foe fosters universal friendship. Our country which is honored this year as the host of other nations in this great gathering of leaders and experts and as the custodian of the magnificent exhibit which will be set up by the entire world, should manifest its appreciation by giving the Congress a setting worthy of the cause, of our guests, and of ourselves. We should endeavor to make it the greatest and the most fruitful Congress which has yet been held, and I assure you of my interest and services to that end.

With expressions of appreciation for the compliment conferred in extending the invitation to become president of the Congress,

Very respectfully,

Theodore Roosevelt.

A RECENT VISIT TO SOME OF THE MEDICAL LABORATORIES ABROAD.

By W. L. Moss, M. D.,

In Charge of the Research Laboratory of the Phipps Dispensary, The Johns Hopkins Hospital.

On going to Europe for the first time, one is embarrassed by the number of attractions which present themselves. Music, art, science, the delights of travel, all beckon alluringly, and over all history is written for those who will read it.

Even should one make the unwise decision to turn his back on all these temptations and confine his attention to medicine alone, there is still a bewildering confusion of clinics, laboratories, courses, etc., from which to choose.

Perhaps the greatest interest to the medical student in spending six months or a year in Europe is in meeting and acquiring a personal knowledge of some of the men who are making the progress and shaping the medical thought of to-day. It adds a tremendous interest to one's reading to know something of the author; what he looks like, where and under what conditions he works; and it helps one in a way to value the man's work; for it occasionally happens that a man is more gifted as a writer than as an investigator.

I was fortunate in having the opportunity of seeing and hearing many of the famous men at the International Hygienic Congress which met in Berlin last September.

This was my first attendance at a large congress and I look back on it as the pleasantest experience of my whole trip. There were about 3000 or 4000 members in attendance, who came from all parts of the world. Among those from the United States were Vaughan, Ravenel, Wiley, Gorgas, Biggs, and Harrington. Strong of Manila was one of the official delegates. It was interesting that Dr. Agramonte of Havana, the only surviving member of the Yellow Fever Commission, and Professor Vaughan, the only surviving member of the Typhoid Fever Commission, appointed by the United States Government, were both delegates to this congress.

A simple enumeration of the nine sections of the congress, all of which met simultaneously, will give an idea of the scope of the congress:

I. Hygienic Microbiology and Parasitology.
II. Dietetic Hygiene: Hygienic Physiology.
III. Hygiene of Childhood and Schools.
IV. Professional Hygiene and Care of the Working Classes.
V. Combating Infectious Diseases and Care of the Sick.
VIa. Hygiene of Dwellings, Townships, and Waters.
VIb. Hygiene of Traffic: Life Saving.
VII. Military, Colonial and Naval Hygiene.
VIII. Demography.

There were nearly a thousand papers read, including the regularly appointed discussions, so that it was difficult to get a comprehensive idea of all that was done and said. On the whole, I think there was nothing strikingly new of great importance brought out, but the papers collectively form a very good resumé of the most important work done in the last few years.

The mornings were occupied with the reading and discussion of papers; the afternoons in the same way or in visiting local institutions of interest, such as hospitals, laboratories, water works, garbage disposal plants, etc., and the evenings were given over to social functions, of which there were dinners, receptions, theaters, operas, concerts, etc. The Germans arranged the entertainment of the members of the congress with the same careful attention to details for which their scientific work is noted, and there were exceptions made to the prevailing rule of "Dutch treat." There was no lack of amusing incidents which happened in connection with the congress. The entertainment which was provided for one afternoon was to consist of a number of walks through interesting parts of the city under the guidance, as Cook would say, of "expert lecturers"—a sort of "seeing Berlin trip" on foot. The routes had all been carefully planned and ninety mounted policemen had been stationed along the way to keep any of the party from straying or straggling. A corps of guides were in waiting at the appointed hour and place, and only one man presented himself to take the walk.

The first laboratory in which I worked was that of Geheimrat Wassermann in the Institute for Infectious Diseases. The Institute is situated out in the northern part of Berlin, with large well-equipped laboratories and facilities for extensive animal experiments. It is sometimes spoken of as Koch's laboratory; but of late Koch has been but little in Berlin, being most of the time away on various government commissions in South Africa or elsewhere. Geheimrat Gaffky is the director of the Institute and Geheimrat Wassermann is at the head of one of its departments. The laboratory adjoins the Virchow Hospital, with which it has a working affiliation and from the infectious wards of which it draws much of its material.

Wassermann himself is a comparatively young man and well-read in the work done outside as well as in Germany. He is very full of ideas and working under him is stimulating. He is doing considerable work on the fixation of complement, and the method as applied to the diagnosis of the parasyphilides such as tabes and general paresis is, I believe, reliable and very useful, and affords interesting confirmation of the theory of the luetic origin of these diseases.

The effort is being made to apply the same principle to the diagnosis of various infectious diseases, including tuberculosis, but the latter disease presents difficulties which have not yet been satisfactorily overcome. Another interesting application of the fixation of complement which is being made consists in applying this test to various bacteria which have been suggested as the etiological factors in some of the infectious diseases, the causes of which have not yet been definitely settled. In view of the recent use of the Flexner "antimenin-

gococcus" serum it is interesting to note that Wassermann is making and supplying to physicians and hospitals an "anti-meningococcus" serum, the use of which, they claim, is attended with favorable results. A further interesting application of the fixation of complement method is made in testing the strength of this serum.

I next spent about six weeks in the Kaiserliche Gesundheitsamt, the bacteriological department of which is located at Grosse Lichterfelde, about half an hour's ride from Berlin.

Here were the finest laboratories I saw while in Europe. Situated in a pleasant little village surrounded by broad fields and green woods, with every facility for carrying on the most thorough work, easily accessible to the chief city of the German Empire, the lot of the men privileged to work here seemed truly an enviable one.

The Gesundheitsamt, with its four divisions: (I) Chemico-hygienic, (II) Medical, (III) Veterinary, (IV) Bacteriological, is under the presidency of Ober Geheimrat Bumm, the gynecologist. The Bacteriological Department at Grosse Lichterfelde is under the directorship of Geheimrat Uhlenhuth. Here Neufeld is working and it was in this laboratory that Schaudinn did his work.

The laboratories are equipped with every convenience. The apparatus is all of the best design and workmanship, and a large factory (Lautenschläger's) makes any new or special apparatus which may be required. Well trained "Dieners" do all drudgery and routine work. Extensive stables furnish an almost unlimited supply of animals so necessary, especially for tuberculosis work. There are about thirty men working in this laboratory who are free to give up their whole time to research. The spirit prevailing is a thoroughly delightful one. The men talk over their work with each other and there is nothing of that spirit of secrecy and suspicion that one meets with in some other places. Extensive experimental work in pharmacology is also done here. Various therapeutic sera such as cholera, typhoid, paratyphoid, dysentery, etc., are made and tested.

In the medico-legal department Uhlenhuth's biological method (use of precipitating sera) is used in the diagnosis of blood stains, the detection of horse or other foreign flesh in sausage, etc.

In the protozoan department the *Spirochæte pallida*, various trypanosomes and spirillum of relapsing fever are being studied.

In the bacteriological division there is a special department under Weber for the study of tuberculosis with an annual appropriation of about $90,000. In this department extensive work is being carried on. Some of the problems under consideration are: Mode of infection; Relation between human and bovine types; Possibility of tuberculous cows excreting bacilli in their milk without lesions in the udder, etc. Extensive tests have been made with the recent tuberculins and vaccines put forth by Behring, and many beautiful pathological specimens from cattle "protected" or treated by the various preparations made at Marburg were on exhibition at the Hygienic Congress. They have not found Behring's claims for any of them substantiated.

After leaving Berlin I spent a few days pleasantly in Halle, but did not find any especial activity in tuberculosis work there. Fränkel, who is at the head of the Hygienic Institute, is at present working on trypanosomes.

A visit to the university was interesting and I was surprised to find so many men there whose names at least were familiar: Eberth, Harnack, Bramann, Karl Fränkel, v. Mering and Sobernheim.

In Dresden, Schmorl in discussing infection in tuberculosis declared himself very positively an "inhalationist." He said that from the pathological evidence he felt there could be little doubt of the importance of this mode of infection.

I next spent a few days in the Hygienic Laboratory at Breslau, where I had the pleasure of meeting Geheimrat Flügge, a big, kind, courteous old gentleman whose simplicity of manner was altogether charming. In this country we would call him a "gentleman of the old school."

The most interesting thing I saw in his laboratory was the demonstration of his apparatus for inhalation experiments. The apparatus consists of a chamber into which the heads of the animals are introduced and through which an emulsion of tubercle bacilli is sprayed, the animals breathing them. Calculations are made by which the number of bacilli inhaled by an animal are approximated. Flügge finds that 50 tubercle bacilli taken into the lungs of a guinea-pig will produce tuberculosis and death. The results of these experiments as compared with those of his feeding experiments have led Flügge to declare himself very strongly an advocate of the "inhalation theory."

Everywhere I went I asked two questions:

Along what lines may we look for a cure of tuberculosis, with most hope of success? and secondly, What is known of the nature of the immunity which the human organism is capable of developing against tuberculosis? We know that certain cases of tuberculosis undergo a spontaneous cure, and reasoning from the analogy of what takes place in some of the other infectious diseases we may suppose that the cure takes place by virtue of the development in the human body of some form of immunity. To the second question I got practically no answers. Wright would say, "by virtue of the development of an opsonic immunity," while Marmorek would say, "in part at least by the development of an antitoxic immunity."

I was almost equally unsuccessful with my first question. Aside from those who have produced one sort of serum or another, or one of the numerous tuberculins and vaccines, there seemed to be no agreement as to what lines of research gave the most promise of success. Flügge did not commit himself but merely said he was interested to see what would be the results of the efforts to immunize with the living protoplasmic substance of the tubercle bacilli. For this purpose the bacilli are ground in a "ball" mill in order to destroy their viability but not to destroy their living protoplasm. Inoculations are made with emulsions of the thus-treated bacilli.

In von Escherich's clinic in Vienna von Pirquet is carry-

ing out as a routine measure his cutaneous tuberculin test. Here he has a children's hospital of two or three hundred beds and is doing all the tests himself, making very careful observations and keeping exact statistics. I had seen Pirquet's test used in Baginski's clinic in Berlin and in Czerny's clinic in Breslau, and had accepted the opinions of those men and others who had criticized the test, and felt that it was of little value. By going to Vienna, however, I learned that it is always best to go to the original source where possible, for even with such a simple bit of technique as is involved in carrying out this test, none of the others whom I saw were doing it exactly as Pirquet had described.

The test is made simultaneously with three or four progressive dilutions of tuberculin; a control with salt solution is always made at the same time. The technique is as follows: After cleaning the forearm of the child with ether, a drop of each of the various dilutions of tuberculin and the sodium chloride is placed on the arm at intervals of about one and a half inches. The inoculation is made with a small platinum instrument the end of which is drill-shaped. Placing the point in the middle of the drop of salt solution a slight abrasion is made in the skin by twisting the instrument. Similar abrasions are made under the other drops beginning with the highest dilution and progressing to the lowest dilution. The inoculated areas are now protected by placing bits of cotton over them. The height of the reaction is reached in 18 to 20 hours; if the result is positive a circumscribed inflammatory area 1 to $1\frac{1}{2}$ cm. in diameter and slightly raised is seen with the first two or three dilutions of the tuberculin. The reaction diminishes with the progressive dilutions of the tuberculin, and with the last one or two dilutions and the control salt solution there is only the tiny abrasion, practically uninflamed, made by the platinum point. In a negative case there is no inflammatory reaction under any of the drops.

Pirquet has post-mortem records on 100 cases in which the test has been made; I haven't the exact figures; but about 90 per cent of the positive reactions were confirmed, and there was a similarly large percentage of negative cases at autopsy which previously had not given the reaction. He is patiently and painstakingly working away, making this routine test on all the cases which come into the hospital, and as opportunity affords is increasing his autopsy statistics.

In Munich I did not see any tuberculosis work but spent four or five days very delightfully in Professor Müller's wards. His was the most interesting medical clinic that I visited and reminded me more of the Johns Hopkins than any other that I saw. One of Müller's assistants, Dr. Saarthoff, has been doing some work on opsonins, and has come to about the same conclusion in regard to Wright's technique that was reached by Dr. Cole and his co-workers in the biological laboratory of the Johns Hopkins Hospital last year. In Nuremberg, Heidelberg and Frankfurt I found nothing noteworthy in the study of tuberculosis.

In Ehrlich's laboratory extensive research on cancer is being done; and Neisser and Guerrini are working on opsonins, but are not using Wright's method of estimation. They have devised a method, the principle of which seemed to me better than any other used, and they claim to have tested the accuracy of their results and to find the method quite adequate. Ehrlich himself is interested in trypanosomes and in his chemical laboratory is making many synthetic preparations with which he is preparing to kill them.

I spent three weeks most delightfully in Paris. At the Pasteur Institute they are carrying on some work on tuberculosis, but did not seem disposed to talk much about what they were doing. Among other things, they are studying the tuberculin reaction and hypersusceptibility, or anaphylaxia.

Metchnikoff is interested in his work on changing the intestinal flora. I believe he expects to be able to replace the colon bacillus and some of the other normal inhabitants by producing an overgrowth of lactic acid bacilli. He does this by feeding a preparation called "lactobacilline," milk which is previously sterilized and then coagulated by the introduction of lactic acid bacilli.

Levaditi is working on opsonins and considers the technique of Wright reliable and sufficiently accurate for their practical estimation.

Marmorek was the most enthusiastic worker in tuberculosis that I found abroad. At one time the head of the tuberculosis department of the Pasteur Institute, the radical views he held on this disease led to the severance of his connection with the institution. He had friends, however, who had faith in his work and who furnished the financial backing for the establishment of his laboratory and stables at Neuilly, where he carries on an extensive work and produces the serum which is used to a considerable extent in Germany and other countries, and in a few places in the United States, including the Phipps Dispensary of the Johns Hopkins Hospital. Marmorek has received reports of over 900 cases in which his serum has been used with about 50 per cent of reported cures. These all belong to the great middle group of patients, not the early incipient or the extremely advanced, almost moribund cases. Marmorek's claims are briefly as follows: That he obtains by selection what he designates as primitive cultures of tubercle bacilli, differing morphologically, biologically and tinctorially from the ordinary cultures. The most important characteristic, as he claims, of these primitive cultures is, that they produce, contrary to the experience of other investigators, a soluble toxin. His horses are immunized by the injection of this soluble toxin and react by the production of an antitoxin. He furthermore states that the best results and highest percentage of cures occur in acute miliary tuberculosis and acute tuberculous pneumonia, when taken in the early stages before extensive destruction of tissue has taken place—conditions in which he considers the great gravity is due to the excessive toxæmia. Whatever may be the justification of Marmorek's claims, he certainly showed me remarkable cultures of what he called his primitive bacilli. Whereas in other laboratories it requires 12 to 15 days to produce a good film of growth covering the entire surface of the bouillon flasks, Marmorek showed such growths which were only 4 days old.

I saw the conjunctival tuberculin reaction of Calmette

used in Berlin by Citron, one of Wassermann's former assistants, and in Paris by Delille, an attending physician at the Hospital for Infants' Diseases; both spoke encouragingly of the test, but most interesting of all was Osler's statement that he had seen it used in a number of cases and felt that it was a valuable diagnostic method.

While in Paris I also called on Widal and Chantemesse. The latter talked about his antityphoid serum and the conjunctival test in typhoid fever which he proposed, basing it on the analogy to the tuberculin test. He claims that the conjunctival reaction in typhoid fever is of positive diagnostic value and in his laboratory is making the powder which he uses in the test. He has published a series of 5000 cases of typhoid fever which he has treated with his serum, and reports a mortality of about 4 per cent. His claims as to the nature of his serum were not quite clear, except that among other things I believe he says it contains opsonin. He will not furnish his serum to anyone else wishing to use it, stating as his reason for not doing so, that its administration is not without danger except in the hands of one who has had great experience with it. The dose is $\frac{1}{2}$ to 2 drops given subcutaneously and it is seldom repeated more than once. From the smallness of the dose it would seem that if the serum really has any efficacy it must be in the nature of an active immunization, as with such a minute quantity one could scarcely introduce a sufficient number of immune bodies to confer any passive immunity.

Wright in discussing this serum suggested that in reality Chantemesse might be giving a vaccine instead of a specific serum, by explaining that if the horses were bled shortly after the introduction of large numbers of bacilli, some of the bacilli themselves might be recovered in the blood, and that the serum then became a vaccine, and its efficacy in part at least might be due to the bacilli it contained. In regard to the results following the use of the serum, Chantemesse claims that there is usually, at first, a slight transient rise in temperature followed by a steady decline, that the excretion of urine is greatly increased, that cyanosis and delirium are much less frequently present and that the mortality is greatly reduced.

In London I had the pleasure of spending about a week in Wright's laboratory. Within the past year he has gotten into his new laboratory, which is large and conveniently arranged and very adequately equipped; this is in St. Mary's Hospital. Twelve or fifteen men are working here on opsonins or related problems under Wright's direction. The cases are all drawn from the out-patient department of St. Mary's with the exception of a few cases which some of Wright's assistants are asked to treat in the wards. The average attendance on the dispensary clinic which is held twice a week is about 30 to 40; most of the cases are tuberculosis and Wright prefers the non-phthisical forms. He is more or less confining his attention to tuberculosis, because, as one of his assistants said, they feel that the method must stand or fall by the result of the treatment of this disease.

I was not in London long enough to see anything of the clinical results Wright is getting, so I confined my attention largely to the detail of the technique. Apparently Wright was getting much more consistent results with his method of estimating the index than we were able to get here in the Johns Hopkins laboratory last year. I noted a few points of interest in this connection. In estimating the opsonic index they use an emulsion of tubercle bacilli which will give a very low phagocytic index—an average of $1\frac{1}{2}$ to 2 bacilli per leucocyte. They use as a norm the average phagocytic index of three or four healthy individuals, whose indices must fall within certain fairly narrow limits of each other. They count 100 cells from each of their normals; and if they all come out within the set limits, all good and well, but if one of them varies too much, they count another 100 cells on this slide; and if this does not bring the result within the limits, a new preparation is made from the erring serum and another 100 or 200 cells counted. Furthermore they have adopted a rule which is rather hard to understand. Any cell which contains more than 4 times the average number for the slide under consideration is disregarded. For example, if a slide is averaging $1\frac{1}{2}$ bacilli per leucocyte, all cells containing seven or more bacilli are disregarded. They say that in following the above rules they are using judgment in counting.

A report of the committee for the study of special diseases from Oxford and Cambridge Universities, being an "Inquiry into the Value of the Opsonic Index" by Fitzgerald, Whiteman and Strangeways, may be of interest in so far as their conclusions are practically the same as reached in the laboratory of the Johns Hopkins Hospital last year.

Bullock, in the London Hospital, is treating tuberculosis with tuberculin, using the opsonic index as a means of diagnosis and an indication for treatment in the same way as Wright does.

One of the most delightful experiences of my whole trip was several days spent with Professor Sims Woodhead at Cambridge. Doctor Woodhead is a member of the Royal Tuberculosis Commission, and with him I had the pleasure of visiting the farms and laboratory at Stansted, where the experimental work is being done. They are studying the relation of the human and bovine types of bacilli, and the dangers to man from the bovine and to cattle from the human type, together with related problems such as the possibility of the transformation of one type into the other and so forth. The German commission came to very definite conclusions as to the non-identity of the two types and the impossibility of one type ever going over into the other, and I think the English commission are almost of the same opinion. At variance with these views are those held by Marmorek, who thinks there is but one type of tuberculosis bacillus.

The English commission is carrying on very extensive work with great care and thoroughness and under ideal conditions. They have two model dairy farms two miles apart, with laboratories on each, and a central laboratory and residence for the members of the commission half-way between the two farms. All the experimental work on human tuberculosis is done on one farm and all the work on bovine tuberculosis is

done on the other. No material ever goes from one farm to the other. All the specimens from both are brought to the central laboratory, where they are studied. The commission receives on the average about $50,000 a year with which to defray the expenses of the work. The farms and laboratory were the gift of Lord Blythe.

The last place visited before returning home was Liverpool, where Dr. Nathan Raw showed me a large series of tuberculosis cases which he is treating with tuberculin. He believes that with rare exceptions pulmonary tuberculosis is caused by the human type of bacillus and that most of the other forms of tuberculosis, such as that of glands, bones, joints, skin, and possibly the meninges, are caused by the bovine type of bacillus. He further believes that the two types are antagonistic to each other and that an attack with one form confers a certain degree of immunity against the other form. Accordingly he gives those patients whom he thinks to be infected with bacilli of the human type, namely the phthisical cases, tuberculin made from the bovine bacillus; and to patients infected with the bovine bacillus, he gives tuberculin made from the human type. He thinks that the results he is getting justify his views.

It may be interesting in closing to review briefly the impressions I got as to the lines of laboratory work in which at present the greatest activity is being manifested. Everywhere work is being done on tuberculosis. The study of trypanosomes is occupying an important place in many laboratories. Numerous large and well equipped laboratories have been established for the experimental study of cancer. In almost every laboratory there are men who can show you beautiful preparations of the *Spirochæte pallida*. With the exception of a few laboratories the study of opsonins is just being begun in Germany.

Von Behring's protracted absence from his laboratory on account of illness prevented my going to Marburg and it was a disappointment not to have time for a visit to Calmette's laboratory at Lille and to that of Maragliano at Genoa.

FURTHER NOTE ON MRS. PACKARD.[1]

By W. R. Dunton, Jr., M. D.,

Assistant Physician Sheppard and Enoch Pratt Hospital, Towson, Maryland.

Since the publication of my paper entitled "Mrs. Packard, and Her Influence upon Laws for Commitment of the Insane," I have acquired additional information which I thought might be of interest to others.

When I read the above paper I had not seen a copy of Mrs. Packard's book, "The Great Drama, or, The Millennial Harbinger," but since, I have secured a copy of the first part and from it have learned that it was published in twelve parts, having sub-titles as follows: Vol. I. The Great Drama, or, The Millennial Harbinger. Vol. II. The Grand Central Depot. Vol. III. A Spiritual Impression. The Celestial Train. Vol. IV. Uzzah—The Terrestrial Train. Vol. V. A Symbol. A Sermon. The Lightning Express Train. Vol. VI. The Sodom of America—The Infernal Freight Train. Vol. VII. A Journey—First Class Passenger Train—Lightning Express. Vol. VIII. Journey Continued—Second Class Passenger Train—Lightning Express. Vol. IX. Hospital Scenes; or, The Central America Depot. Vol. X. Hospital Scenes Continued. Vol. XI. The Pack of Wolves and The Sick Baby—The Express Train. Vol. XII. The Supplement—The Last Passenger Train. Express.

The special interest attached to this work, is the fact that Mrs. Packard profited sufficiently from its sale to support herself and do considerable travelling. It is bound in paper, contains a portrait of the authoress and a wood-cut of her home in Manteno, the same as that appearing in the second volume of her "Modern Persecution." This is not the only similarity, however, for we find a good deal of the book in the same form in "Modern Persecution," including an account of her trial. The preface is rather remarkable, being written in what the authoress characterizes as an allegorical style, similar to the remaining volumes, which the following quotations will illustrate:

> "Lincoln is such a long man, and I've had to tell him so many stories to keep him in good spirits, while I *soft-soaped* him, to clean him, for I found him pretty dirty, I can tell you—especially behind his ears. I guess that's the reason he's been so hard of hearing of late! But I've got most through using this liey soap—the hard soap will answer my present purpose, or where I've got him to, and I like it much better; he has a better scent now" (p. 10).
>
> "And I've told you of our model farmer Jones, of this hospital—of Haslet and Comstock, the Abraham and Lot of the Sodom of America—of the theology of Parks—of the star of the Beech—of Spring on the car, as our fourth corporal of the anti-slavery regiment—of the Greeley and Cheever lions—of the engineer, McClellan—of the phrenologist, Fowler-of Elliott, the auctioneer who knocked off my bedstead and chairs to the two and three cent bidders on Shelburne hills—of Dr. Duncan, who *can dun*, but don't, because Shelburne folks won't give him, nor their minister a chance to,—of Dr. Packard, who packed such a load of infamy to his grave with him, because he became a Universalist and a Spiritualist, in his old age—of our generous cousin Ophelia, and her brimming ladle of flowing sweet—of my husband's treacherous sister Sybil, who, after having helped her brother to make his children orphans, now wants me and my orphans to *thank her* for taking care of them, *for me!*"

The remainder of the book, with the exception of a "Note of Thanks to my Patrons," and a few testimonials, is the same as is found in "Modern Persecution," although arranged differently.

A noticeable point is the difference in title upon the cover page and the title page, that on the former reading, "A Strike

[1] See The Johns Hopkins Hospital Bulletin, Vol. XVIII, 1907.

for Freedom, or, The Persecuted Wife's Exposure of the Scenes Behind the Curtain. In a Life Drama! Of Twelve Parts, by Mrs. E. P. W. Packard." And on the latter, "Great Disclosure of Spiritual Wickedness! In High Places. With An Appeal to the Government to Protect the Inalienable Rights of Married Women. Written under the inspection of Dr. M'Farland, Superintendent of Insane Asylum, Jacksonville, Ill. Fourth Edition. Boston: Published by the Authoress. 1865."

This same tendency to prolixity in title is shown in another volume, the cover of which reads, "Three Years' Imprisonment For Religious Belief. A Narrative of Fact"; and the title page reading, "Marital Power Exemplified in Mrs. Packard's Trial, and Self-defense from the Charge of Insanity, or, Three Years' Imprisonment for Religious Belief, by the Arbitrary Will of a Husband, with an Appeal to the Government to so change the Laws as to afford Legal Protection to Married Women. By Mrs. E. P. W. Packard. Hartford: Published by Case, Lockwood & Company, 1866." This is a volume of 37 pages, bound in black glazed boards, containing the two pictures referred to above, and in the introduction of which is a summary of the first volume of "Modern Persecution." Following this there is an account of the trial, which does not vary from the account in "Modern Persecution." It is evident that Mrs. Packard had no hesitation, therefore, in publishing the same material under different titles.

Through the kindness of Dr. Henry Hurd, I have seen a copy of the Special Report of the Trustees of the Illinois Hospital in Review of a Report of a Legislative Committee Appointed by the Twenty-fifth General Assembly, 1868. From the evidence submitted, it would appear that the Trustees were justified in their criticism of the legislative committee, which had apparently performed its task more inefficiently than is usual. Their comments are logical, dignified and temperate. It would take too much time to go into the report very thoroughly, but I should like to make two quotations. In comparing the present legislative committee with a former one, it is stated that:

> "The committee of 1867 was born of the insane imaginings of a single individual, of whose insanity no intelligent physician remains for half an hour in doubt, but whose industry and natural talent were sufficient to make her an available head to the loosely floating elements of disaffection which the justly rigid discipline of a large institution of this nature inevitably creates about it" (p. 92).

And the following applies as much to-day as it did in 1868:

> "Every reflecting person must be aware that hardly a day can pass, where large numbers of the insane are gathered, in which something may not transpire capable of being styled an abuse, in the mind of one at all disposed to give it that appellation. The act of administering food to one determined on suicide by starvation; of restraining the violence of the homicide; of even putting clothes upon the naked—not to mention a host of easily conceived circumstances, likely any moment to arise, of the most varied character—will always afford material out of which an ill disposition may construct any amount of the same kind of testimony as the committee has encouraged into being. That such instances occur more frequently in the Illinois hospital for the insane than in any other American State Institution of like capacity, the Trustees, from the evidence afforded in the replies of some twenty Superintendents of the leading Institutions of the country to inquiries addressed to them, do not believe" (p. 85).

As an appendix, there is a dignified letter from Dr. McFarland who makes comment upon some of the testimony, and extracts from the rules and regulations referring to attendants and their duties. One of these apparently indicates how great has been the advance in hydrotherapeutics in forty years. "Once, each week, when water is to be obtained, every patient (exceptions only being made by the Superintendent) shall have a tepid bath, and it is highly desirable that the feet be washed, even when general bathing is not possible."

Certainly, a weekly bath or a weekly foot-wash is a marked contrast to the continuous bath and other elaborate hydrotherapeutic measures which are practiced now in hospitals for the insane, but Dr. Hurd has explained this by the fact that when the Illinois Hospital was built, no attention was paid to the water supply, and as a consequence, their supply was extremely meagre until the establishment of a town water supply at Jacksonville, which was extended to the hospital. Previously, the only way to get water was by damming up a small stream, and economy in the use of water was very necessary, so that in reality, this affords no measure of the hydrotherapeutic arrangements for those days.

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THE OBSTETRICAL SIGNIFICANCE OF THE BLOOD PRESSURES AND THEIR RELATION TO THE WORK OF THE HEART.[1]

By J. Morris Slemons, M. D.,
Associate in Obstetrics,
AND
F. C. Goldsborough, M. D.,
Instructor in Obstetrics.
(*From the Obstetrical Clinic of the Johns Hopkins Hospital.*)

We were led to undertake observations upon blood pressure in obstetrical conditions through Erlanger's[2] invention of a sphygmomanometer which makes possible the objective, clinical estimation of both the systolic, or maximum, and the diastolic, or minimum arterial tension. The difference between these two he designates the pulse pressure. From this last and the diastolic pressure, according to Dawson,[3] the mean arterial tension is satisfactorily determined.

If the pulse rate be noted simultaneously with the estimation of the blood pressures, it becomes possible to determine an index for the volume of blood put out by the heart per minute, and finally an index of the work of the heart.

Our observations were made upon ten normal pregnant women, five primigravidæ and five multigravidæ. The former furnished 176 and the latter 103 of our records during pregnancy. The period of observation varied from 9 to 102 days ante-partum, while every patient was studied for two weeks in the puerperium. The observations before and after delivery were made at 11 a. m. with the patient in bed. During labor records were obtained as complete as possible, but were unavoidably limited by the unfavorable conditions then prevalent for the use of the instrument.

Pulse Rate.

The average pulse rate was 80.5 during pregnancy and 70.5 during the puerperium. In the latter period five patients presented a slower pulse than this average; whereas in pregnancy an average pulse below 70 occurred but once. Bradycardia, which Riegel defines as a pulse rate below 60, was met with but once during pregnancy, and then in a primigravida. This patient and one other, a multipara, presented the same phenomenon in the puerperium. Thus, a typically slow puerperal pulse occurred in 20 per cent of our cases, which corresponds with the frequence noted in a much larger series of patients by Hémey and by Heil.

During the puerperium the pulse rate averaged the same in both primiparæ and multiparæ, but during pregnancy was appreciably higher in the latter. Consequently, multiparæ exhibit a relatively greater slowing after delivery; although a less marked drop sometimes occurs in primiparæ, but may be absent.

A fair contrast between the pulse rate in pregnancy and the puerperium cannot be made without observations extending through the month preceding delivery. Several of our patients have exhibited a gradual slowing of the pulse within this time. On this account records for the last one or two weeks before labor may fail to show a more rapid rate than prevails in the puerperium, when more extended observations would have shown the contrast.

Where labor is proceeding normally, the pulse rate shows little or no change from the level of pregnancy, except during the uterine contractions. The acceleration which is then apparent quickly disappears as the pain dies away.

In multiparæ an almost immediate drop in the rate of the pulse occurs following parturition; whereas, in primiparæ, the rate varies but little from the average count during pregnancy.

Systolic Pressure.

The average systolic pressure during pregnancy in our patients was 127 mm. Hg; whereas Erlanger regards 110 mm. Hg. as the average with his instrument in normal non-pregnant adults between 20 and 25 years of age. No great stress should be placed upon the value of an average for the whole of pregnancy, for we have found, as Schroeder pointed out, and as Vogeler's composite chart shows, that there is a distinct tendency for the maximum pressure to rise as pregnancy advances. We cannot verify Schatz's finding of a rhythmic change in this pressure during pregnancy. In not a few cases, however, a noteworthy drop of systolic tension appears a day or so before the onset of labor.

A pressure of 180 during pregnancy is not always associated with a toxæmia, as Vaquez, Beau and Vogeler contend. In a IX-para we have noted values above this several times, although her average systolic pressure during pregnancy was 169 mm. Hg.

The average systolic pressure in the puerperium was 115 mm. Hg. The average values in multiparæ at this time being from 9 to 49 mm. lower than during pregnancy; while varying values were observed in primiparæ. Thus, in some instances the same average obtained in both pregnancy and the puerperium, but when it was lower in the latter period, it differed from the preceding pregnancy at most by 13 mm. Hg.

During labor, we have noted the well-known rise in tension with each uterine contraction and between pains found a somewhat higher pressure than the average observed during pregnancy. The drop in systolic pressure which is generally believed to occur coincident with the birth of the child seems

[1] The full paper of which this is an abstract will appear in the Johns Hopkins Hospital Reports.

[2] Erlanger: Johns Hopkins Hosp. Reports, 1904, XII, 53.

[3] Dawson: Brit. Med. Jour., 1906, II, 996.

to us to be largely dependent upon action of the anæsthetic employed at that time, as the phenomenon was absent in one of our patients who declined to take chloroform. In this instance we noted identical pressures at the end of the second and the beginning of the third stage, the drop to the puerperal level occurring gradually after the extrusion of the placenta.

Diastolic Pressure.

The tension in the arteries during diastole is usually taken to represent the opposition which these vessels offer to the expulsion of blood from the heart, and in consequence, is frequently termed the "peripheral resistance." Erlanger finds 65 mm. Hg. as the average normal diastolic pressure with his instrument.

The average of all our observations was 74 mm. Hg. during pregnancy, and 72.5 in the puerperium. The highest diastolic pressure is met with at the time of labor, especially during the uterine contractions of the second stage, and usually varies between 80 and 110 mm. Hg. according to the character of the contraction, although higher or lower values may occur. Throughout pregnancy, labor and the puerperium corresponding fluctuations are noted in the systolic and diastolic pressures, although they are much less extreme in the latter.

The peripheral resistance would seem to be slightly increased in both pregnancy and the puerperium, but in neither period can any characteristic difference be noted between women pregnant for the first or a subsequent time. Most frequently (7 cases) a slight drop, averaging from 2 to 7 mm., is seen from pregnancy to the puerperium. Yet two cases, one a primipara and the other a multipara, present the opposite change, while in one case the same average obtained in both periods.

Pulse Pressure.

Dawson has shown that the difference between the systolic and the diastolic tension, which is designated as the pulse pressure, supplies an index of the output of the heart per systole. It is evident that the greater the difference is between the first two pressures, the greater will be the values of blood entering the arteries. With a systolic pressure of 110 and a diastolic of 65, the normal averages given above, the pulse pressure will be 45.

Our observations show an average pulse pressure of 43 for the puerperium, which would appear to be practically normal. Moreover, at this time there is no notable difference between primiparæ and multiparæ, the former averaging 44 and the latter 42.

Pregnancy is attended by a larger pulse pressure, which is higher in multiparous women, averaging 60 as compared with 49 in primigravidæ. A change from pregnancy to the puerperium is also quite apparent in the multiparous women when the cases are studied individually, a definite drop occurring in the later period; on the other hand, practically no change occurs in primiparæ.

During labor, the uterine contractions are attended by an increased pulse pressure consequent upon a greater rise in the systolic than in the diastolic tension. In the intervals between pains, the pulse pressure remains at approximately the level of pregnancy until the expulsion of the child is in progress, when higher values are obtained. Chloroform anæsthesia causes a marked drop in pulse pressure.

Both before and after parturition, the pulse pressure is especially free of fluctuations, remaining most nearly constant of all the circulatory factors we have studied.

Mean Pressure.

Following the suggestion of Dawson, we have computed the mean tension in the arteries by adding one-third the pulse pressure to the diastolic pressure. From the normal values previously cited, this apparently averages 80 mm. of Hg. in non-pregnant individuals.

During pregnancy we note no difference in primigravidæ, or in multigravidæ, who present an average of 90 and 92, respectively. In both there is a tendency toward a gradual rise in the mean arterial tension as term is approached. In primiparæ no marked difference occurs in the puerperium, but in multiparæ there is usually a drop of 5 to 17 mm. Hg. The reverse was noted in one patient whose mean pressure averaged 88 in pregnancy and 90 in the puerperium.

Parturition is attended with an increased mean pressure, which is accentuated during uterine contractions, while chloroform anæsthesia leads to a marked drop.

Cardiac Output.

It is clear that the pulse pressure which is the index of the output of the heart per systole, multiplied by the pulse rate will supply an index of the entire cardiac output per minute. This circulatory factor is chiefly of interest in that it enables us to compute the work which the heart is doing. If the normal pulse pressure be accepted as 45 and the average normal pulse rate as 72, then the average index of the cardiac output in normal individuals becomes 3240.

From this figure we have noted only slight variations in the puerperium, the average being 3137 in primiparæ and 2921 in multiparæ.

Pregnancy differs markedly from the puerperium in the multiparæ, who present an average of 5332 in the former period. The contrast is less strongly marked in first pregnancies and may be altogether lacking. The average cardiac output in our five primigravidæ has been 3325.

Work of the Heart.

According to Dawson, an index of the work which is done by the heart may be ascertained by multiplying the mean arterial pressure by the cardiac output per minute. The average for normal adults, 259,000, is not to be insisted upon, as wide variations occur in perfectly healthy individuals. Nevertheless, this index is most helpful in determining variations in the work of the heart in the same person under different circumstances.

The average of this index in all our patients was 418,000

during pregnancy and 267,000 during the puerperium. The individual averages were as follows:

	Primiparæ.			Multiparæ.	
Case.	Pregnancy.	Puerperium.	Case.	Pregnancy.	Puerperium.
I	248,000	290,000	VI	1,065,000	337,000
II	195,000	206,000	VII	331,000	156,000
III	324,000	309,000	VIII	325,000	182,000
IV	343,000	274,000	IX	501,000	307,000
V	429,000	327,000	X	421,000	279,000

From this table it will be seen that the hearts of multiparæ invariably do less work in the puerperium than in pregnancy—the average of our observations showing a difference of nearly 50 per cent. Among the primiparæ it is again the rule to find the heart work in pregnancy in excess of that in the puerperium, though the contrast is less marked—the difference being only about 10 per cent.

Two primiparous patients did not follow this rule. In connection with them, however, it seems fair to state certain facts which may serve to explain their irregularity. Case I was under observation for only 9 days. This is significant in that we have frequently noted a decrease in the value of the work index within the ten days prior to delivery. Again Case II was delivered somewhat prematurely. The child weighed 2755 grams and from the menstrual history was born one month before term. Inasmuch as the work of the heart gradually increases as pregnancy advances, it is not improbable that had this patient reached full term the index would have presented a somewhat higher average.

The greater cardiac work in pregnancy than in the puerperium is referable to two factors, namely a relatively more vigorous systole and a relatively more frequent pulse rate. Whether one or the other of these factors is always predominant, our material is not large enough to determine. This point, as well as the primary cause for each of these phenomena, remains for further research.

A predominance of greater cardiac work among multigravidæ would be expected, since the first-born children are commonly not so heavy as their successors, and one would suppose that a more active circulation would predispose to larger children. That there is some connection between the heart work and the child's weight is borne out not only by the fact that the babies of multiparæ in our series have a larger average weight than those of the primiparæ, but also by the finding that larger children were born to those primiparous women who presented the larger work indices. It should be mentioned, however, that we do not find the variations in this index corresponding absolutely with the variations in the weights of the children. Nor would this be expected, since many factors other than the growth of the child enter into the requirements for work made upon the heart.

The early part of labor exhibits no greater values for the work index that existed in pregnancy save a slight temporary rise with each uterine contraction. With the advent of the second stage, the heart is subjected to a heavier strain than formerly, both during and between the pains. This continues, in not a few cases, into the first few hours of the puerperium and in general is recovered from much more promptly by multiparous women than by those who have just passed through their first confinement.

In conclusion we would thank Dr. J. Whitridge Williams, who has encouraged us to undertake this work and given us the freest use of his clinic for its pursuance. Although numerous records of the systolic pressure during pregnancy have been published by very competent observers, they have not been in very close accord, chiefly due to the use of different instruments. No estimation, however, of the diastolic pressure in obstetrical conditions has been published previously. In consequence it seemed of interest to determine this and to calculate the work of the heart in normal patients as a basis for further study of the circulation in pregnancy complicated by toxæmia or organic disease of the heart.

THE BARRED ROAD TO ANATOMY.[1]

By Howard A. Kelly, M. D.,
Professor of Gynæcology, Johns Hopkins University.

Two skeletons, that of Burke and one exhumed by Liston, gaze hollow-eyed from museum cases; and a new verb, "to burke," is created. A man of this generation has to explore anatomical annals for an explanation, and his wildest imagination cannot conceive the deadly feud and storm, the backwash of invective, the fear, the hate and the tumult, which that man when living gave rise to, nor believe that the verb was born—strange contradiction—of murder and avarice, of lofty ambition, and disinterested care for suffering humanity.

Let a seeker's eyes grow accustomed to the shades of wilful obstruction and groundless prejudice which obscured the period in which those men lived, and the ghostly forms and protesting voices of Knox and Liston, Cheselden, Monro and Syme will be seen and heard. Let him tread the Anatomical Road, mid shadows still more dense, and discern heroes, such as Servetus, Etienne and Vesalius, disheartened, hindered and eventually martyred in a just and eager desire to know more intimately the secrets of our human habitation.

To take a fairer view of the resurrectionary period, picture to yourselves this present theatre crowded with students ready for an anatomical demonstration. No one is absent, for it is the greatest day of the year, that on which the dissection of the one corpse allowed yearly will be made. Next week the subject will have to be only a dog or a cat, or perhaps a monkey; for there is nothing else available from which to demonstrate the "human" anatomy.

[1] Read at the meeting of the Johns Hopkins Historical Society, October 14, 1907.

Imagine a great surgeon having to take part in an affair such as this:

A rare osteological specimen has been buried without dissection, and high fees offered to resurrectionists have failed to secure the subject. Moreover, the relations, suspecting a theft, have kept careful watch every night by the grave.

One afternoon, two gentlemen drive up to an inn near the cemetery and ask that their horse may be cared for. They also say that a man will bring a box and put it in the carriage. In a short time this man appears, the stable boy alone noticing a resemblance to the driver. In an hour's time the two gentlemen return, pay their bill and drive away.

Night comes on, the grave-watchers appear. They find no neatly turfed grave, but disordered earth and an empty coffin. The great anatomist has not been daunted by the failure of his men. He has sent for London's best resurrectionist, and visiting the little cemetery with him has in thirty minutes, and in broad daylight, accomplished the most daring piece of resurrecting work ever attempted.

And this anatomist was Liston himself; but few who gaze at a skeleton labelled No. 3489 in the Royal College of Surgeons Museum can realize the feud waged over it, or the circumstances which determined its theft.

On this side of the Atlantic also, Science was chafing at the fetters she bore, and this present generation of students may not know that here also the resurrectionists flourished. Dr. John Collins Warren gives a little glimpse of things as they were in 1781.

There were, he says cheerfully, plenty of bodies before the Revolutionary War, but few after, and we had perhaps only two paupers a year. One night, hearing that a man without relatives had been buried, he and Dr. William Ingalls, of Boston, went with a party to exhume the body. As they were lifting it over the wall, a man came along. One of the party, pretending to be intoxicated, addressed him and picked a quarrel with the stranger, while another, coming up, took the stranger's part and led him away. Young Warren was left to finish tidying the grave, while the others drove off. When his father saw what a fine subject had been procured he was very much pleased, and "the body lasted the whole course of lectures."

More schools were formed in New England, and Boston had not subjects to spare, so these were obtained from New York at great expense and fear of detection. Dr. Warren once sent two strong students to exhume a body, and the watch sprang upon them. One student escaped in the wagon, but the other had a series of escapades on his way to the watch-house. He escaped once by jumping over a wall into a marsh. Seized again, as he was walking with ostentatious slowness he again escaped into an empty house and dived beneath some shavings, where he lay till morning. But the excitement and hard running brought on hemorrhage of the lungs, and he soon after died a martyr to legislative prejudice. Two or three times Warren feared his house would be attacked, and most of the bodies had to come from New York at $25.00 each, the students combining to buy them at $5.00 each for their schools.

Dr. Joseph McDowell, founder of the McDowell Medical College in St. Louis and a firm believer in ghosts, tells an interesting story:

"A German girl died with a very unusual disease, and we determined to get her body for dissection. We dug it up and laid it in the college; but the Germans heard of it and made things lively, and I heard they were coming that night to search for the body. I went down to hide it and threw it over my shoulder to carry it to the top loft to conceal it in the rafters. At the top of the first flight, out went my lamp. I put down the corpse and relighted it. Out again, and as I felt for another match I saw my dead mother standing a little way off and beckoning to me. I followed to the loft, hid the body and came down in the dark. At the window where my mother had appeared were two armed Germans, talking, and when I got to the dissecting room door I saw six more down in the hall. My only chance of hiding was in the dissecting room. Opening the door as the Germans came upstairs, I saw my mother standing by the table from which I had taken the corpse. I had no light, but light came from her. I lay down and covered my face with the sheet and the men came in. They uncovered four bodies and came to me. I thought of jumping up and scaring them, but heard a voice say, 'Be still, be still.' They were looking for a girl, and my feet were sticking out at the end of the table. 'Here's a fellow who died in his boots; I guess he is a fresh one,' said a German; and they did not even uncover my face, but left the house."

About 27 years ago, the janitor of the old Atlanta Medical College went "resurrecting" in the white burying-ground with an aid who was intoxicated. On coming back the aid gave away the object of their mission to the ferryman on the Chattahoochee river. In a few days the sheriff arrived with a search-warrant and went to the dissecting room, with the son of the deceased, who had come to identify his father. He stood by the very body he had come to seek and declared it was not his father, as he could not recognize him. So the officers departed, quite satisfied.

On another occasion a body was sold to the anatomist by an undertaker, who promised to put a bag of sand in the coffin and nail it down. In the evening a weeping widow came to claim the body, and the coffin was buried next day. The supposed widow and some students came at night to dig up the corpse, and to their disgust found only a bag of sand.

The usual custom was to check the box or case right through and post the check on to the surgeon. One porter said to a doctor, "Lor', that's the heaviest trunk I've ever lifted." "Books," answered the doctor, gravely, "students always carry so many." "He must have a lot of books this time," muttered the porter as he shouldered the trunk. But "Pickles," not "Books," was the usual label for exhumed bodies.

Once, in Baltimore, two students exhumed a man. They boldly set him up between them on the wagon seat and drove

off. It was a chilly night; and they stopped at an inn to drink, leaving their silent companion propped against the wagon side. Bye and bye came along a genial policeman to pass remarks on the weather; but the corpse was past remarks, and answered not a word. The policeman playfully prodded him in the stomach to make him speak, and was horrified by a heavy body falling on him and an icy face being pressed to his. He promptly fainted. People gathered around, but the students hastily put the body back and drove hurriedly away. Worse luck attended them. Their speeding wagon tried to climb a lamp-post and lost a wheel. Their hurry to be off had aroused suspicion, and they were overtaken and did the best thing possible—took to their heels.[1]

The "Hubbardton raid," which occurred in 1830, was one of these resurrectionary episodes, in which the sturdy sons and fathers and husbands of Hubbardton, armed with weapons from the farm, marched in a body to the old college to rescue from its dissecting room the body of the wife of one of their number, whose new-made grave was found empty.

The most famous incident of those irregular days, however, was the burking case of 1886.

In Baltimore, an old white woman was murdered deliberately by three negroes, and her body was sold to the University of Maryland Hospital for $15.00, of which an equal division was made among the three conspirators.

It seems strange that the one who incited the crime and arranged its most fiendish acts should have been the one by whom it was betrayed, but such is the case. For some reason or other he became frightened after the crime had been fully accomplished, and called upon the president of the university to tell him that a body lately received bore suspicious marks of violence! This was the beginning of the end. The president of the university inspected the body, agreed with his informant, and then called in the police. The informant was arrested on suspicion, broke down and confessed every detail of the crime. In the trial that followed, the chief murderer was sentenced to be hanged. The sentence was duly executed.

This and other occurrences that linger far back in the people's memory brought about the establishment of the State Board of Anatomy in a bill approved March 22, 1890.

This obstructive condition of affairs prevailed when masters of surgery like Knox and Liston, Cuvier, Bichat, Bell and our foremost men here, were doing their best work; yet Edinburgh, where most body-snatching had to be done, could boast an anatomical school which had existed nine years before the birth of Vesalius, and four before that of Ambrose Paré. Think of exacting an acquaintance with practical anatomy from every student when the price of gaining such knowledge frequently meant prison, or, at least, opprobrium. The law, at the instance of a dissatisfied patient, would fine the doctor in court for not displaying "proper skill" in a science to which the road was barred. Prison on the one hand, a monetary loss on the other. The condition, also, of the man who would write of surgery seems little advanced beyond that of Cortesius, the Italian anatomist in the early part of the 17th century who, "though he had a great desire to finish his work on practical anatomy, only twice in twenty-four years could procure an opportunity of dissecting a human body."

The urgent necessity for bodies to supply the ever increasing schools in London and Edinburgh, in order to keep students together and give the professor a fair chance of success, led to the resurrectionists being countenanced by the doctors; but the odious slander that men like Knox, Liston and Brookes could wink, even connive, at murder and assault, to gain bodies for dissection, is most ridiculous and improbable.

Frequently unauthorized persons would offer bodies or propose to sell their own or those of their relations after death.

One day Sir Astley Cooper received a letter which is still in the Library of the Royal College of Surgeons. It ran:

> Sir. I have been informed you are in the habit of purchasing bodys and allowing the person a sum weekly; knowing a poor woman that is desirous of doing so, I have taken the liberty to call and know the truth.

On the back Sir Astley has written:

> The *truth* is that you deserve to be hanged for such an unfeeling act.

Here is a letter I myself received last year; I give it verbatim:

VEAZIE, MAINE, /06

TO PROF. KELLEY.

Dear Doctor.—I take my pen in hand to write you in regards of my present state Trusting I may hear from you asoon as you posbley can.

I am a sword swoller and a Curio, and have puzzled all the leading Physicians through out america swolling swords from 18 to 27 inches in length, eating glass taks and all indyegestable thing and etc. Pitch rosum, wax, lead, copper and small gravel sticking pins, needles, hat pins, and etc. in all parts of the stomic. sticking huge needles through the tounge and one inche from the heart.

Eating glass as freely as you eat candy, small frogs alive pass them the same as any food, swollow young snakes, lizzards, allow any rattle snake to bit me in any part of the arm or leg and place fangs in the limb becomes stiff for a few days or so and then disappears. I am about through in life and doctors say I can not hold out more than a year therefore I thought I would write you and see if I posbley could come to terms with you thinking I may be some use to you after I am dead and gone I think it better for a Collage to have my remains as it may be a lesson that a good many young and old doctors have never witnessed as I have been before the exray over a thousand times as if you think you could use my body for the purpose of studying I ask the doctors in charge of the Johns Hopkins Hospital or to whom it may concern that I Albertus J. Pierce agree to give my body to the said Hospital to what ever purpose they see fit to do according to the laws of said insustion for the benefit of the said Hospital or College.

Before I agree to give my remains I believe the said College ought to give one hundred dollars for my remains in advance

[1] This tale is told of many different localities, with suitable variations.

and I to give a written out contract to this effect by the law if desired.

I trust that I may hear from you at an early date.

Yours Trustfully

Prof. ————,

Veazie, Maine.

The great objection to relatives' being dissected was the association of dissection and criminality; for at first only the bodies of murderers, and, later on, those of general criminals, were allowed to the schools. Also, there was the old superstition about preserving the body intact which dates from earliest times (*"Si quis violaverit ad inferos nunc recipiatur"*). But it need hardly be said that when once popular feeling was aroused it was fanned and fed by rumors of the wildest, crudest improbabilities—pretty much of the type which nowadays figure as facts, which the supposed "eminent surgeon" has taken the trouble to impart to the smallest reporter of the smallest local paper, concerning operations in a hospital.

In the latter half of the 17th century, apprentices and grave-diggers were the only body-stealers; but eventually necessity forced the surgeons to deal with gangs of professional "resurrectionists," and even to obtain subjects from Ireland, as an advertisement offering to deliver such bodies "sweet and sound" in a medical paper of the period testifies.

Burke and his associate Hare were welcome visitors, for they were clever at their work—a work begun originally in all honesty. An old man in their lodging-house had died owing them much rent, and the idea of selling the body to recoup themselves occurred. A sack of tan filled the coffin, and Burke and Hare themselves followed the funeral with outward solemnity and sorrow—with $37.00 in their pockets for the corpse sold.

$37.00 to men whose spare cash often amounted to 37 cents! How to get more in the same way became the question. Lodgers could not conveniently die every week; cemeteries, with their "mort-safe" iron railings, were difficult to rob. A devilish inspiration came. Those who would not die should die, but die—oh yes!—so carefully that no anatomist's suspicions should be aroused. Down the dirty court in old Edinburgh came a decent body full of years and whisky. She is enticed by simulated friendliness to come to the lodging-house. More whisky is given until she is drunkenly unconscious. Burke and Hare exchange glances; then the former throws himself on her prostrate body, and Hare holds her mouth and nose. There is a prolonged struggle, but the "burking" has been effectual, and $60.00 is secured from the anatomists.

Like two bloodthirsty spiders, Burke and Hare now lurked by the door of their infernal den. Two more tippling women, easily enticed by the idea of drink, are "burked"—a twin tragedy attending the death of one, for a daughter is seeking her mother through the town, but not yet has suspicion fallen on the lodging-house keepers nor their mistresses. The girl comes seeking, directed there by one who has seen her mother with Hare. She is met with sympathy and kindness, with assurance that she will meet her mother at Mid-Calder. Why not go there? But a glass of whisky before starting? Another? The eyes grow sleepy, the speech thick; soon the girl lies in drunken slumber in that fatal little room, with its "one window opening onto a dead wall," and she finds her mother through grim Murder's portals.

Victim after victim followed, but all chosen from the tramp class, who, having nothing about them to excite notice on their appearance in town, gave no cause for alarm on their disappearance from it. But avarice made the men reckless; a very beautiful young woman was enticed in by drink and "burked." As she lay on the dissecting table, a student exclaimed that he had seen her a day or two before. Rigid enquiries were made of Burke, whose powers of lying were equal to the emergency and satisfied the surgeons.

Soon after, Burke and Hare seemed to be rendered absolutely reckless by their easy earnings and unlimited whisky. An harmless idiot lad named Daft Jamie, whom everyone in Edinburgh knew, was "burked" and taken to Surgeons' Square. Could the students, who had seen him daily, fail to recognize him? History is silent, but suspicion began to fly in ever narrowing circles over the stronghold of murder held by Burke. The balladmonger, after the arrest of Burke and Hare, kept popular sympathy alive for the inoffensive, gentle idiot:

"Now both these blood-hounds him engage,
As hungry tygers fill'd with rage,
Nor did they handle axe or knife,
To take away Daft Jamie's life.

"No sooner done, than in a chest
They cramm'd this lately welcom'd guest,
And bore him into Surgeons' Square—
A subject fresh—a victim rare!

"And soon he's on the table laid,
Expos'd to the dissecting blade;
But where his members now may lay
Is not for me—or you—to say."

And another broadsheet circulated says:

"An Account of the most horrid and unchristian actions of the grave makers in Edinburgh, their raising and selling of the Dead, abhorred by Turks and Heathens, found out in this present year 1711."

"Methink I hear the latter trumpet sound,
When emptie graves into this place is found,
Of young and old, which is most strange to me,
What kind of resurrection this may be.
I thought God had reserved this power alone
Unto himself, till He erect'd His throne
Into the clouds with His attendants by,
That He might judge the world in equity;
But now I see the contrair' in our land,
Since men do raise the dead by their own hand."

Some said there existed in the city a gang of famished wretches, who, having once tasted human flesh, were keen on tasting more. People were afraid to go out at night, and when the body of another victim was traced to Surgeons'

Square, the fury against the doctors ran so high that their lives were endangered. It must be admitted even by their warmest defenders that they had shown at any rate an unwise amount of confidence in the men of professedly low morals who had supplied the anatomical schools. Knox specially suffered, his house being attacked by the mob.

"Down the close and up the stair,
But and ben wi' Burke and Hare;
Burke's the butcher, Hare's the thief,
Knox the man that buys the beef,"

sang the rabble, but there was not a single circumstance in Knox's life to which blame could be attached.

Great ingenuity was used in the grave-robbery and equal ingenuity in protecting tombs, but the watch paid to protect was often in league with the thieves. Curiously, there were two indictable crimes, felony and misdemeanor, in these thefts, the first incurring the severer punishment. If the body were taken it was simply misdemeanor, but to steal the shroud and coffin was felony. Why then take the trouble to dig the coffin up? Weeping relatives, as they stood by the apparently untouched grave congratulated themselves that no spoiling of their dead had been effected, but unwittingly shed tears over empty coffins. Just notice that recently disturbed square of turf some fifteen feet off. From it down to the coffin-head a sloping tunnel has been made and the coffin drawn up by iron hooks. The shroud has been carefully put back, the tunnel refilled, the square of turf replaced. The formidable iron grille over the tomb was useless. Spring guns were often set in the churchyards, but what unfeeling custodian could hinder a weeping widow from seeking the grave of her husband—and loosening the wires? Disconsolate relatives were useful even before death came. Was a pauper dying in workhouse, hospital or lodging house? Was there no one to close his eyes, to pay for his humble grave; no one to whisper a prayer into his dying ear? A respectable countryman comes seeking his prodigal nephew; a minister, not of godly mien, comes to read to the dying; a benevolent citizen who has heard of the case (He has indeed!) offers to pay for the funeral; a motherly old soul (smelling strongly of whisky) says she will nurse the dying man. But nepotism and piety, philanthropy and pity, are all simulated by these resurrectionists in disguise, and they in a few hours will have transferred the body to the anatomists, and eventually attend a pauper's funeral.

At first there were few professional resurrectionists; yet soon, both in London and in Edinburgh, gangs of low men had the anatomists at their mercy with regard to supplies. So much had to be paid down at the beginning of the session, and so much for "finishing" on delivery. Among Sir Astley Cooper's papers is an entry: "May 10, 1827, Paid Hollis, Vaughan and Llewellyn, finishing money £6. 6. 0" ($30.00).

If the preliminary payment were refused, things went badly with the surgeon. To arouse suspicion two dead bodies in an advanced stage of decomposition were once for this reason dropped at night near the door of Brookes, the London teacher. Two young ladies fell over them and raised such a commotion that, had it not been for the police, Brookes would have fared badly. Another time a body was brought him in his absence which he had neither ordered nor paid for. Fortunately it was discovered before night that the subject was very much alive—and a burglar.

Here is an ingenious trick. A man would steal a body which lay awaiting the inquest. He would sell it to an anatomist and then give information to the police where to find it. These naturally restored it to the coroner, who, after the inquest, restored it to the relations, and if the man was friendless these generally turned out to be confederates of the man who had stolen it, and thus the corpse was once more sold to the schools.

The severest encounters in graveyards were between gangs of rival resurrectionists, or "sack-'em-up" men. Often shots would be fired and men severely wounded.

In 1822 an undertaker Bridgman invented a patent wrought-iron coffin and obtained permission from the ecclesiastical and state courts to sell it on payment of a fee on each one, and another man who made patent coffins put some of Southey's ballad, *The Surgeon's Warning,* on his advertisement. The Surgeon fears he will be dissected as he himself has dissected others, so implores a metal coffin for himself:

"And my 'prentices will surely come
And carve me bone from bone,
And I, who have rifled the dead man's grave,
Shall never rest in my own.

"Bury me in lead when I am dead,
My brethren, I entreat,
And see the coffin weigh'd, I beg,
Lest the plumber should be a cheat.

"And let it be solder'd closely down,
Strong as strong can be, I implore,
And put it in a patent coffin,
That I may rise no more.

"They burst the patent coffin first,
And then cut through the lead,
And they laugh'd aloud when they saw the shroud,
Because they had got at the dead.

"And they allow'd the sexton the shroud,
And they put the coffin back,
And nose and knees they did then squeeze
The surgeon in a sack.

"So they carried the sack pick-a-back,
And they carved him bone from bone,
But what became of the surgeon's soul,
Was never to mortal known."

In England matters were rapidly growing too bad to endure much longer. Twenty-two bodies were seized ready for shipment to Edinburgh. These were in casks and labelled "Bitter salts." There was no reason to suspect violence, as the bodies were uninjured; but the resurrectionists had realized the marketable value of a corpse otherwise than for anatomical purposes, and it was a well-known fact that camp-followers extracted the teeth of the dead in war time, and the body-snatchers often made as much as $250.00 by extracting the

teeth of subjects. But something more was done, savoring of fairy-tale ogres. Listen:

Police Reports, 1732: "John Loftas, the Grave-Digger, committed to prison for robbing of *dead!* corpses, has confessed to the plunder of above 50, not only of their coffins and burial cloaths, *but of their fat where bodies afforded any.*"[1]

"I have made candles of infants' fat," Southey makes his repentant surgeon say. Truly it would be a grim chain of circumstances if, from a candle so composed, a light from the dead were given to reveal the secrets of the dead in the dissecting room.

"Come now," said some doctors to the public, "The Government bars the road to necessary knowledge; mourning relatives erect still greater impediments; who will make a voluntary offering of his body for the sake of suffering humanity?" So, in Ireland and London, lectures were given on Anatomy to the public, and at once popular prejudice gave way to common sense and many promised their bodies. Jeremy Bentham left his for dissection, and so did Messenger Monsey, a physician, also ninety-nine gentlemen in Dublin.

But it was Murder's bloody hand which set the seal on the Act of 1832 which took the barriers down. The story of Burke and Hare was repeated in London; Avarice, glutted with gold, grew careless, and the two murderers drew the teeth of their twelve-year-old victim before selling the body. The demonstrator noticed this and sent for the police. The resurrectionists were hanged and the Anatomy Bill rolled slowly through Parliament, its clauses at first so narrow, and favoring London so much, that *The Lancet* dubbed it "A Bill to Prevent Country Surgeons from Studying Surgery."

[1] An ancient superstition still prevailed concerning the efficacy of human fat in keeping away evil spirits and as a charm for various diseases.

VARIATIONS IN THE CALCIUM CONTENT OF THE BLOOD FOLLOWING THERAPEUTIC MEASURES.

By THOS. R. BOGGS, M. D.,

Associate in Medicine, Johns Hopkins University; Assistant Resident Physician, The Johns Hopkins Hospital.

(From the Clinical Laboratory of The Johns Hopkins Hospital and University.)

It has long been known that calcium salts in certain concentrations exert an accelerating effect upon the coagulation of the blood in vitro. Furthermore, it has been shown that when calcium salts are taken by mouth or injected subcutaneously or into the circulation, similar effects may be produced. And it has been assumed that this increased coagulability is due to an increase in the calcium salts of the blood.

Conversely, it has been demonstrated that substances which fix the calcium of the blood in insoluble form diminish, or inhibit altogether, the coagulation in vitro under certain conditions.

Following from these observations it has been assumed that some diseases or intoxications which are associated with decreased coagulability may owe this change to the loss of calcium salts. And that, where such changes are a source of danger or discomfort to the patient, the normal condition of the blood, as to coagulability, may be restored by the administration of calcium in soluble form.

Owing, however, to the labor and difficulty incident to the determination of variations in the small amount of calcium present in the blood but little has been done to demonstrate the nature and extent of these variations. Abderhalden[1] has published extensive analyses of the normal blood of domestic animals and gives the calcium content, reckoned as CaO per 1000 parts by weight, as follows:

Dog's blood (whole)	0.062 to 0.049 0/00
Dog's serum	0.113 to 0.111 0/00
Jarisch's[2] figures are	0.09 to 0.14 0/00

[1] Abderhalden: Zeitschr. für Physiol. Chemie, 1898, Bd. 25, p. 65.

[2] Jarisch: Zeitschr. für Biol., 1892, Bd. 29, p. 325. Cit. by Rey.

There are no analyses on dog's plasma known to me.

Wright and Knapp[3] in 1902 described a direct titremetric method employed by them in the observation of patients. The exceedingly minute quantities of blood used and certain obvious technical inaccuracies incident to the method make their results open to question and require further confirmation by control methods of proven exactness.

The same criticism holds good for the similar method published by Bell.[4]

Rey,[5] in his investigations of the calcium excretion through the intestines, showed that after intravenous injections of calcium salts the content of calcium in the blood remained higher than normal as long as four days. He made only one or two observations, however, and did not pursue the matter of the calcium content of the blood very far.

The writer has been interested for several years in trying, by various methods, to determine accurately if such variations exist and if so, what relation, if any, they might bear to the exhibition of calcium or decalcifying agents therapeutically.

It was determined after long and careful investigation that the small amounts of blood obtained from patients under ordinary conditions (15-20 cc.) were insufficient for any trustworthy quantitative chemical separation of the calcium salts.

Three methods were used in the studies on patients' blood and on animals, and it may be of interest to mention briefly the advantages and shortcomings of each.

[3] Wright and Knapp: Medico-Chir. Trans., Lond., 1903, Vol. 86, p. 1-19.

[4] Bell, W. B.: Brit. Med. Journ., 1907, Vol. I, p. 920.

[5] Rey: Archiv für Exp. Path. und Pharm., 1895, Bd. 35, p. 295.

At first the attempt was made to separate the calcium and weigh it as sulphate or oxide. Here we met a difficulty not described fully in chemical tests; namely, the practical impossibility of separating the last traces of iron from calcium in the presence of unknown quantities of phosphoric acid, a condition always present in the blood ash.

We are taught that if we are careful to change all the iron to the ferric state we can then precipitate it with acetate, separating the iron quantitatively as ferric phosphate and acetate and leaving the calcium in solution for eventual separation as oxalate. Now as a matter of fact, while this method is sufficiently accurate for relatively large quantities of ash, there is always a trace of iron left, no matter how often or how carefully we repeat the process, and this may be enough to impair the accuracy of gravimetric determination when the total amount of calcium is very minute. And it is for this reason that we discarded gravimetric determination.

The turbidity method, described by Schreiner and Failzer [6] for calcium determinations in soil, was next tried, as it seemed extremely sensitive. Here again the minute trace of iron which clung to the calcium was just sufficient to tinge the turbid solutions with yellow, making accurate colorimetric comparisons with a standard solution impossible. At the suggestion of Dr. Schreiner we tried treatment of the calcium solutions with carbon black, hoping thus to have the iron held back in the filter, but were unsuccessful in removing the iron except by such processes as gave a slight loss of calcium also.

It was next decided to transfer the observations to dogs and use larger quantities of blood and after separation of the calcium from the ash, as indicated in the first method, to determine it as oxalate titremetrically with carefully standardized solutions of potassium permanganate; for it is easy to show that traces of ferric iron mixed in the solutions of calcium do not effect the permanganate titration.

After trying various more rapid oxidizing methods, such as Neumann's and fusion with nitrate and alkali mixtures, we discarded these and burned the dried blood over a very low flame, carefully avoiding a fusing temperature. In this way oxidation was more perfect as no partly carbonized material was covered by fused salts and solution of the resulting ash became very simple.

The permanganate solutions were heated in the autoclave before standardization and then checked as to their titre every three or four days with weighed portions of recrystallized oxalic acid of the highest purity. Solutions made in this way will maintain their titre for many weeks. The solution was of such strength that 1 cc. was equivalent to 0.0014 gram CaO.

A series of observations was then begun on normal dogs in order to determine the calcium content of the blood and to observe any marked variations in it. The dogs were confined in metabolism cages of large size and fed on a mixed diet of bread and meat without bones. Under these conditions the calcium content of the blood varied but little.

[6] Schreiner and Failzer: U. S. Dept. Ag., Bureau Soils, 1906, Bull. 31.

Blood was obtained from the femoral or carotid arteries and measured in portions of 50 or 100 cc. Where it was desired to separate plasma from corpuscles the blood was received into a volumetric flask containing hirudin dissolved in a measured quantity of 0.85 per cent sodium chloride solution. Hirudin is free from calcium and does not alter that of the blood.

After centrifugation to separate the corpuscles the diluted plasma was dried and ashed and its calcium determined as above.

In this way we found the normal calcium content of whole dog's blood calculated as CaO to be from 0.084-0.094 grams per litre. In the plasma the content was 0.140 per litre in two dogs examined. It will be noted that these figures vary from those in the tables of Abderhalden and others, but it is to be observed that these determinations are made on a basis of volume (1 litre), while the others are based on weight (1 kilo).

After determining the normal calcium content, the dogs were then fed calcium lactate or calcium acetate by mouth in doses of 2 to 4 grams twice daily and after three to five days the animals were again bled and the calcium determined. In such animals there was a marked and constant increase in the calcium content of the blood as shown by the protocols appended.

Coincident with this change there was an increase in the coagulability of the blood which had also been demonstrated in previous publications ([7] [8] [9]).

In one animal we tried subcutaneous injection of calcium acetate with a similar result. Lastly we tried the effect of citric acid on other dogs controlled in the same way. The acid was given powdered in large capsules, the dose being 2 to 4 grams twice daily. In these animals there was a slight diminution of the calcium content of the blood, but no appreciable change in the coagulability as tested with the Brodie-Russell instrument.

PROTOCOLS.

Normal Dogs.

I. Medium-sized terrier. Ether anæsthesia.
50 cc. whole blood, dried and ashed, yielded 0.0042 grams CaO or 0.084 per litre.

II. Small mongrel. Ether anæsthesia.
(a) 50 cc. whole blood, dried and ashed, yielded 0.0046 grams CaO or 0.092 per litre.
(b) 50 cc. plasma, corrected for dilution, yielded 0.007 grams CaO or 0.140 per litre.

III. Small black terrier. Ether anæsthesia.
25 cc. plasma, corrected for dilution, yielded 0.0035 grams CaO or 0.140 per litre.

Calcium Feeding.

I. Large black spaniel. Ether anæsthesia.
(a) 50 cc. whole blood yielded 0.0044 grams CaO or 0.088 per litre. After three days interval of normal feeding the dog

[7] Wright: Brit. Med. Journ., 1894, II, p. 57, and other papers.
[8] Boggs: Deutsches Archiv für Klin. Med., 1904, Bd. 79, p. 540. *Idem:* International Clinics, 1908, Vol. 1, p. 31.
[9] Sladen & Hinman: Johns Hopkins Hosp. Bull., 1907, Vol. 18, p. 207.

was given 2 x 4 grams calcium lactate daily with his food for three days.

(b) 6th day bled. Ether anæsthesia. 50 cc. whole blood yielded 0.006 grams CaO or 0.120 per litre. An increase of
0.120
0.088
0.032 grams or 36 per cent over content before feeding calcium.

II. Large brown setter. Ether anæsthesia.

(a) 50 cc. whole blood yielded 0.0042 grams CaO or 0.084 per litre. Fed 2 x 4 grams calcium lactate daily for four days succeeding.

(b) 5th day bled. Ether anæsthesia. 50 cc. whole blood yielded 0.0056 grams CaO or 0.112 per litre. An increase of
0.112
0.084
0.028 grams per litre or 33 per cent over the content before feeding calcium.

CITRIC ACID FEEDING.

Large black and white mongrel. Ether anæsthesia.

(a) 50 cc. whole blood yielded 0.0047 grams CaO or 0.094 grams per litre. Fed 2 x 4 grams citric acid daily for four days.

(b) 4th day bled. Ether anæsthesia. 50 cc. whole blood yielded 0.0042 grams CaO or 0.0084 per litre. A loss of 0.010 grams per litre or 10.6 per cent less than before taking the acid.

SUMMARY.

The calcium content of the blood in normal dogs may be very greatly increased by feeding calcium salts by mouth and this increase is maintained several days during the feeding. It is probable that small therapeutic doses of certain simple fatty acids diminish the calcium content of the blood though to a less degree.

In concluding it gives me pleasure to acknowledge the kindness of Professor Howell, who tested my calcium solutions by Schreiner's method, and the directors and staff of the Hunterian laboratory for the privilege of using the operating room and cages.

I am also indebted to Dr. Oswald Schreiner for suggestions as to the use of carbon black in separating iron from blood ash.

PROCEEDINGS OF SOCIETIES.

THE JOHNS HOPKINS MEDICAL SOCIETY.

February 17, 1908.

Medical Education in the United States.[1] DR. BEVAN.

Methods of medical education in this country have been largely drawn from those of Great Britain and Germany. For a short period about 1850 the influence of the French school was quite evident and later since 1870 the influence of German medicine has predominated. America, however, has not been a mere imitator in the field of medicine as such discoveries as ovariotomy and anæsthesia show. After the Revolution and with the enormous and rapid development of the country west of the Alleghanies, and because of the great demand for physicians in this new country, there grew up a peculiar type of medical school, which was conducted as a business proposition, independent as a rule of any university.

Some of these schools did excellent work and developed such great teachers as Gross, Flint and others, but many of the schools were of a poor class and turned out very poorly qualified men. The urgent demand for doctors led to the establishment of an enormous number of schools and graduation of an enormous number of ill-qualified men. The result has been that we have in the United States to-day the largest number of men per capita and the largest number of medical schools of any country in the world. In fact, we have almost as many medical schools as all of the rest of the world combined. We have 161 and the rest of the world has but 174. We have an overcrowded profession, which will average lower in point of medical training than that of any other of the great nations.

We have, however, a number of schools which are as good as, or superior to, any of those in Great Britain or on the Continent. In the inspection made by the Council on Education on a very liberal and lenient marking, on a marking like a civil service examination, in which the showing of the graduates of the schools before state boards, the preliminary educational requirement, the medical curriculum and the laboratory, dispensary and hospital facilities were considered, 81 of the 161 schools were marked acceptable, above a passing mark of 70; 48 were conditioned between 50 and 70; and 32 were marked below 50, rejected.

The pioneer period has gone by in this country and there is no longer a frontier, but many of the medical schools of the pioneer type remain, where one can see the farce of attempting to teach modern medicine without laboratories, without trained and salaried men in a single laboratory, without dispensaries and without hospitals—schools which are mere quiz classes in which men are prepared to pass state board examinations. The time certainly has arrived when in this country of great wealth and great intelligence and wide opportunity to obtain an education, the medical profession and public should unite to demand a reasonable and thorough training of its medical men. We should insist that medical standards be as high and medical training as thorough as in any other civilized country. The state boards should inspect the medical schools and refuse to recognize those that are not teaching and are not capable of teaching modern medicine. And if the state boards do not do this the public and profession should

[1] An abstract of an address delivered before the Johns Hopkins Medical Society, February 17, 1908, by Dr. Arthur D. Bevan, of Chicago, chairman of the Council on Medical Education of the American Medical Association.

unite and secure proper laws and proper men on the boards, so that the necessary standards can be maintained.

In our inspection of the medical schools we found the weakest feature was in the lack of well equipped laboratories and well trained men for the work of the first two years. The American is practical and is attracted to the practical side of medicine more than to the laboratory side. It is difficult to secure and keep bright men in the laboratory years.

Men teaching medicine should have a complete medical education and at least the amount of clinical experience obtained as a hospital interne, before they attempt to teach in any department of the laboratory years. There should be a closer association and co-operation between the departments of the laboratory and clinical years. I know that the clinical years would be greatly benefited by keeping in touch with the laboratory work and I feel equally confident that the men of anatomy and pathology would be better instructors and much more apt to devote themselves to research work of value, if they kept in touch with the problems and advances in the clinical work. Such a co-operation too would result in providing the best instructors for both the laboratory departments and clinical departments.

I should much prefer to have men in my surgical department, who had devoted three to five years of the work to anatomy or pathology. I believe that such a scheme should be generally adopted of filling the positions in the clinical department by men who have devoted a certain amount of time to the laboratory years. This would provide the laboratory years with the best brains that graduate in medicine. A few of these would remain permanently in the laboratory departments, fascinated by the work; others would enter the clinical work with the best possible foundation.

The clinical teacher must be both teacher and clinician in the widest sense of the term. I have no sympathy for the position that the teacher in the clinical departments should be a salaried man, devoting his entire time to teaching and research. I think that such a position can be shown on analysis to be fallacious and a day-dream of the doctrinaire. It goes without saying that the clinical teacher must devote a large part of his time to teaching and research and that his college work must have the first call on his time. This he can do and at the same time devote a limited amount of time to a lucrative, private practice. Such a man will make a much broader clinical teacher than the man who devotes his entire time to his teaching and draws a salary upon which he lives.

The service of great clinicians will be sought by both the profession and the laity, by rich and poor alike. Some of our great clinical teachers, who earn incomes which are large compared to that of the President of the United States, are not poorer but are often broader men and better teachers and physicians because of that fact. I do not think that it is necessary or desirable to provide large salaries for the great clinicians at the head of the various clinical departments in order to enable them to devote their entire time to teaching and research. If a medical department had sufficient money for such a purpose it might better be used for paying larger salaries to the laboratory men, who are notoriously underpaid, and to providing living salaries for the young men, who are doing the routine teaching and devoting a large amount of their time to research work in the clinical departments.

As a means of comparison between American medical education and that of Europe, let us see what is required of the medical college and the medical student in Great Britain and Germany.

In Great Britain there are 36 medical schools. The control of medical education is in the hands of a General Medical Council. The English boy who eventually studies medicine, beginning at six years of age, has twelve years of preliminary education. He leaves the high school and begins the study of medicine at between 18 and 19, although legally he can begin at 16; he begins what is the minimum five-year course and, as a matter of fact, the average time is more than six years. In 1906 the average time devoted to medical study, of those who are licensed, was six years and eleven months. The first of the five required years is devoted to chemistry, physics and biology and can be taken either in the medical school or in the school of liberal arts. The remaining four years are much like those in our better medical colleges. The fifth year is devoted largely to work in the hospital as a clinical clerk and dresser. The character of the school in England is fairly uniform; there are no very poor or worthless schools corresponding to the poorer schools found in this country.

In Germany the boy begins at six in the public school, studies twelve years and graduates from the Gymnasium at between 18 and 19 years of age, and then enters the medical department of the university. Some of our German friends and some of our college professors have given the German Gymnasium a good deal higher value than it is entitled to in comparison with our best high schools. Graduation from a German Gymnasium requires twelve years of study, just as graduation from our best high schools requires twelve years of study.

From an analysis of the fact I am quite convinced that the American boy who graduates from our best high schools at 18 is quite as capable of beginning the study of medicine as the German boy who graduates from the Gymnasium at 18, and that taking 1000 American boys and comparing them with 1000 German boys, the American product after twelve years of study would be quite the equal in brain and brawn and power of the German product.

A number of our German friends here in America, Professor Muensterberg of Harvard University for instance, would probably not believe this. The same men probably believe that the German navy is much superior to the American navy and with about as much reason. The German boy after leaving the Gymnasium begins a six-year medical course; the first year largely devoted to chemistry, physics and biology; the next two to anatomy, physiology, pharmacology and pathology; then two years in medicine, surgery and the specialties; and since 1904, one year, the sixth year, as an interne in the hospital. The result of the German scheme of education is to turn out a high average of medical men.

Unfortunately, in America we have no uniform standard of medical education. Our medical schools represent the best and the worst in the world. Some demand a college degree, which means four years more preliminary work than the German Gymnasium, and some demand no preliminary education whatever. Both of these extremes are mistakes. It is clearly impossible for a student to begin the study of medicine without a high-school training and a thorough understanding of chemistry, physics and biology; and on the other hand the requirement of a college degree is not in the interest of medicine but in the interest of the college of liberal arts.

If we were to present to the medical faculties of the Universities of Berlin, Vienna, Edinburgh or London, the suggestion that they should demand in addition to their high-school education a four-year arts course in an American college, they would receive the suggestion with astonishment and not consider it seriously at all. A limited number of men will secure a college degree before entering medicine. Such men should be encouraged, but in the framing of the broad university scheme of the medical education, the requirement of the college degree should not be seriously considered by us in America any more than it has been in Great Britain and Germany. It has been unfortunate for the securing of a uniform and high standard of medical education in America that a few of our best universities have seen fit to demand a degree for admission. I have no desire to criticise these schools with higher requirements, but I deeply regret the fact that we have not their great influence and support in securing a uniform and high American requirement, which should be the following:

(a) Graduation from our best high schools, covering the scheme of high-school education recommended by the Committee of Ten of the National Educational Association reported in 1894.

(b) A thorough training in physics, chemistry and biology, and one modern language, preferably German, covering at least one year of work; many of the schools will require two years of this work, which is probably the better plan.

(c) The present four years of medicine of our best medical schools.

(d) A year as an interne in a hospital. This last practical year is one of the most important years in the course and this should be made compulsory. I take it that it will be difficult to make this practical year compulsory in the schools which require a college degree; the necessity of this practical year is to my mind one of the strong arguments against requiring a college degree.

Taking the position of Harvard for instance: The course above recommended, with a thorough training in physics, chemistry and biology and German, the present four-year medical course and the compulsory practical year as a hospital interne, is a very much stronger course and one which would develop much better medical men than the Harvard plan of preliminary requirement of a college degree without any specification of the sciences, such as chemistry, physics, and biology, or a reading knowledge of a modern language, and without a compulsory practical year as a hospital interne.

At the Johns Hopkins, fortunately, physics, chemistry and biology and a reading knowledge of both French and German are required for admission, as well as a college degree. It seems to me perfectly clear, however, that the substitution of a compulsory practical year as a hospital interne for the college degree requirement would make a much stronger course. It certainly would add strength to the movement to secure high and uniform standards, if such institutions as Harvard, Johns Hopkins, Cornell and Western Reserve would adopt some such standard as I have outlined, which is practically the standard of Germany. I believe that these great institutions, if they did this, would fulfil their duty to the public much better than they will by adopting a degree requirement which is so time-consuming that the other institutions of the country cannot agree to it. One of the important functions of these great institutions is to educate thoroughly competent medical men.

A school like Harvard, with its splendid facilities, should educate a large number of high-class medical men; not a limited number. It should hold the same place in the community that is held by the great German universities. It should provide largely the medical men needed in the section of the country in which it is located. Last year about 500 men began the study of medicine in the medical department of the University of Berlin and less than 100 began the study of medicine at Harvard. Our better universities should be on such a basis that they can provide the thoroughly educated medical men for the country and not on such a basis that they will provide but a limited number of men and leave the duty of supplying the bulk of the physicians to poorer, ill-qualified schools. I think the position that we should have in this country a few very high-grade schools with degree requirement and a larger number of schools of poorer grade is untenable. What we need is a uniform, practical, and high standard for all schools. This would make it possible for a student to pass freely from one method school to another which attracted him because of some special course, as is done very generally in Germany.

The "I am holier than thou" position is as weak and untenable when applied to teaching institutions as it is when applied to individuals. Fortunately, there is sweeping over the country a strong movement for a high and uniform standard of medical education. Already more than 50 schools, about two-thirds of the acceptable schools of the country, have agreed to adopt by 1910 as a preliminary requirement a four-year high-school education plus a training in physics, chemistry and biology and one modern language.

The practical year as a hospital interne is largely taking care of itself. Already in our better schools the majority of the graduates secure hospital positions. The desirability of this practical year is thoroughly recognized by them and hospital positions are eagerly sought.

The general adoption of the standard above outlined must come within a few years.

When such a uniform and high standard of medical educa-

tion is generally adopted in this country it will mean a great reduction in the number of medical schools and a decided improvement in the 60 or 80 schools which would probably remain.

In order to obtain this high standard the better elements in the profession must unite and work for a common purpose. In this country we need state aid and private endowment in order to teach modern medicine. We must educate the public in the possibilities of modern medicine for good and show them the needs of medical education for state aid and private endowment.

Chauvinism should have no place in medicine and yet it is well for each nation to have a proper pride in and cultivate a patriotism for its own medical professon and its own medical achievements. We have not done this in America as we should. We have been rather on the other hand prone to belittle our own medical men and our own medical work and to exalt those of Germany, Austria, England and France. We have too often given important positions to foreigners, who have sometimes unfortunately shown no loyalty to our country or to our ideals, and frequently too it has in these cases become evident that the position and opportunity would have developed a much better man out of our own home material.

Let us remember, first, that we are Americans, and let us not be ashamed to cultivate a patriotism for American medicine. In spite of its shortcomings, many of which I have just mentioned, American medicine, even to-day, is from the standpoint of productiveness of both laboratory and clinic superior to that of any other country, except possibly Germany; and in some cases, as in the immediate care of individual cases, in clinical medicine, the purely operative side of clinical surgery, and in surgical technique, America leads the world. American medicine and American medical education has been advancing in the last twenty years by leaps and bounds and we can look forward to the future confident that in the coming great development of modern medicine our country will contribute fully its part.

Discussion.

Dr. Welch.—We are all very grateful to Dr. Bevan for coming here and giving us this extremely interesting exposition. This work is of great importance and national significance. This undertaking of establishing the council of education of the American Medical Association was not entered into with very great enthusiasm. But at the head was placed Dr. Bevan; and to-day, next to the committees of pharmacy and chemistry, this commission is doing perhaps the best work of that association.

Although the recommendations of this council have carried nothing but moral force, it is interesting to note what the work of this council has resulted in. One great feature of the work is, that the presentation of conditions in our medical schools, on the basis of thorough investigation, has led to very important results. The suggestions for improvements made by this council have been most important. The state boards of health have done very important work in this respect, but there is a limit to what these medical examinations can accomplish. In some states the examiners cannot under the law be associated with any medical school, and their questions are often not of an especially practical nature, but serve solely to test the memory of the student for what he may have read.

There is one little point that I should not put quite so strongly as Dr. Bevan has done; that is, that doctors of philosophy and some professors of anatomy, physiology, pharmacology, etc., should not be allowed to teach in medical schools. I believe that in general the teacher should have a general knowledge of practical medicine, but it is not necessary for him to have the degree of doctor of medicine and I should not put the case quite so strongly as Dr. Bevan.

As regards the requirements for entrance into the medical schools, it does not seem as if a four years' high-school course is entirely sufficient. It is difficult to compare our high schools with the German Gymnasium. But the boys who finish the Gymnasium course always seemed to me to get about as much accurate scientific knowledge as an average American in his four years' college course. I believe that the requirements of a mere bachelor of arts degree for entrance to a medical school is a mistake, but I believe that it is right to require a degree which is evidence of work done in scientific studies which are necessary in a doctor's education.

On the whole, we must all agree with the general trend of Dr. Bevan's remarks. It is a plea for better work in general medical practice.

Dr. Hurd.—One suggestion ought to be made in connection with this interesting paper. In some of the western states—Michigan, Wisconsin, Illinois, etc.—the education in the high-schools is a very good one, and a student can enter the state universities directly from them. I think, however, very great harm would be done if it were considered that all over the Union the high schools were equal and gave a suitable preliminary education for entrance into a medical school. It would seem very desirable for the council to take into consideration what a high-school education actually is.

April 6, 1908.

Meeting of the Johns Hopkins Medical Society.

I. The Early Diastolic Heart Sound (The So-called Third Heart Sound).[1] Dr. Thayer.

In May, 1906, before the Association of American Physicians, Dr. Thayer called attention to the frequent presence in young individuals, with apparently normal hearts, of a slight third sound audible in early diastole shortly after the second sound.[2] In June, 1907, Hirschfelder,[3] in an article on "Some Variations in the Form of the Venous Pulse," in which he described the presence of a wave following the so-called *v* wave on the jugular tracing, noted, in an apparently normal indi-

[1] Published in full in the Boston M. & S. J., 1908, CLVIII, 713.

[2] Experimental Studies of Cardiac Murmurs. W. S. Thayer and W. G. MacCallum, Am. J. Med. Sc., Phila., 1907, CXXXIII, 249.

[3] J. Hopkins Hosp. Bull., 1907, XVIII, 265.

vidual, a similar sound. Gibson[4] of Oxford, in November, 1907, in some independent studies upon the same wave in the venous pulse, also observed the sound, while Einthoven[5] succeeded in recording vibrations with his string galvanometer, at a similar period in diastole, vibrations which he interprets as evidence of a third heart sound analogous to that described by Gibson. As a result of observations made during the past six months the following conclusions were reached:

In many healthy individuals, especially in the young, there is audible at the apex of the heart a slight third sound which occurs early in diastole shortly after the second sound. The sound is commoner with a slow pulse; it is better heard in the recumbent posture and especially in the left lateral decubitus. It is sometimes more clearly audible during expiration. The sound is not infrequently associated with a shock which may be visible as well as palpable. The sound and shock are evidently closely connected with the protodiastolic elevation of the cardiogram, which is prominent in these cases.

The onset of this elevation occurred in seven tracings taken from six cases of normal individuals showing this sound, at a period on an average 0.1, the summit about 0.18 of a second after the shoulder of the cardiogram.

The protodiastolic elevation of the cardiogram, when allowance is made for transmission time, corresponds in time to a part of the katacrotic limb of the *v* wave of the jugular pulse, its summit reaching often a point somewhat beyond this. In five out of six cases from which careful tracings were made, the *v* wave was followed by an elevation corresponding to the *h* wave of Hirschfelder (the *b* elevation of Gibson), and on a number of our tracings, the summit of the protodiastolic wave of the cardiogram would appear to correspond, when allowance is made for transmission time, to a point on the anacrotic wave of this elevation.

The summit of the protodiastolic wave of the cardiogram appears to correspond closely in time and in its relations to the venous pulse with the shoulder on the ascending limb of the cardioplethysmogram, which may be well defined in some volume curves of the dog's heart.

The phenomena associated with the early diastolic sound and shock in normal individuals are apparently closely analogous to, if not identical with, those observed in some forms of protodiastolic gallop rhythm. The sound and shock are similar in character and in time, and are associated with like appearances on the cardiogram and in the venous pulse.

The opening snap in mitral stenosis, although usually a somewhat sharper sound, may be very similar in character to the normal third sound; it occurs at much the same period in the cardiac cycle, and is associated with a well marked protodiastolic elevation on the cardiogram.

This third sound and shock are not dissimilar to those observed in adherent pericardium, which are also associated with a sharp protodiastolic elevation on the cardiogram. In a striking example of this condition the protodiastolic elevation corresponded, on the venous tracing, when allowance was made for transmission time, to a sharp depression, the base of which, a point which corresponded in time exactly to the summit of the protodiastolic wave, was followed by a very abrupt rise.

In view of these considerations, it seems clear that the early diastolic sound sometimes heard in normal hearts, is closely associated with the rapid entrance of the blood into the ventricles at the onset of diastole. How rapid this entrance may be is shown by the abrupt ascending limb of some cardioplethysmographic curves. The association of this sound with, (a) the shock sometimes felt by the palpating hand; (b) the sharp shoulder which may be seen on the plethysmogram; (c) the presence in so many of these cases of an *h* wave in the jugular pulse, following, as it does, immediately on the summit of the protodiastolic wave on the cardiogram; (d) together with our observation of one case observed in a dog in which a *visible* interruption of the dilatation of the ventricle was demonstrable in association with the sound, would all suggest:

(1) That at this period early in diastole some structure is thrown into sufficient tension to produce audible vibrations.

(2) That there is further at this period some sudden, slight, temporary arrest or interruption or delay in the rapid dilatation of the ventricle.

Conclusive evidence as to the cause of the phenomenon is as yet wanting. From a consideration of the conditions observed in normal individuals, together with various apparently analogous manifestations occurring in disease, the speaker was disposed to incline toward the hypothesis that the sound is produced by a sudden tension of the mitral and perhaps, at times, of the tricuspid valves occurring at the end of the first and most rapid phase of diastole. This hypothesis is similar to that advanced independently by Hirschfelder and Gibson.

II. Intraventricular Systole. Dr. Stewart.

Dr. Stewart reported a series of experiments on the contraction of the musculature of the conus arteriosus and the aortic ring muscle. The experiments were undertaken with a view of determining to what extent the arterial valves are supported by muscular action. The contractions of the circular fibers of the conus were studied by means of a specially constructed tambour, by which the changes of thickness in the muscular fibers could be recorded, an increase in thickness being caused by a contraction, and a diminution in thickness by a relaxation. It was found that the circular fibers of the conus remain in a state of increased tone after the longitudinal and spiral fibers have passed into diastole. A similar result was obtained by a different method in the case of the aortic ring muscle. The contraction of this muscle was recorded by a pronged instrument passed down the carotid artery and so constructed that a contraction of the muscle approximated the prongs. This movement of the prongs was recorded by a tambour attached to the opposite pole of the instrument. The contraction of the ring muscle seems to occur about 0.05 of a second after the commencement of ventricular

[4] Lancet, Lond., 1907, II, 1380.
[5] Arch. f. d. ges. Physiol., Bonn, 1907, CXX, 31.

systole and persists for a variable period, usually from 0.04 to 0.07 of a second after the beginning of diastole.

It appears from this investigation that the complete closure of the arterial orifices is partly due to valvular and partly to muscular action. Inefficient action of these circular fibers will help to explain the transient aortic and pulmonary inefficiencies which are met with clinically.

Discussion.

Dr. Hirschfelder expressed his pleasure that Dr. Thayer's results confirmed his own, especially the association of the third sound with the *h* wave and the time relation in diastole. He said he had not been able to produce a third sound in a dead heart by merely putting the mitral valves under tension, and thought therefore that we must be conservative in accepting this explanation. In mitral stenosis we would expect to obtain the sound somewhat later in diastole because of the slower filling of the ventricle. Perhaps the mid-diastolic rumble is this sound occurring later. There was considerable previous evidence to lead us to expect what Dr. Stewart has found. However, it is scarcely possible that so important a discovery as Dr. Stewart's can be settled in so short a time. Several possible objections to Dr. Stewart's interpretations occur to one. In the first place, both the pulmonary artery and aorta are arched, and when the pressure is increased they tend to straighten out and "kick" at the orifices. One can easily see that this kick tends to raise the base of the pulmonary artery with the production of an indentation just below it, and cause just such a wave as Dr. Stewart has obtained. Secondly, the chamber of the left ventricle may be divided into a superior papillary portion and an inferior papillary portion. In systole two phenomena are going on: all the blood is being rushed into the body of the ventricle, and there is a closed period much the same as the conduction period in Dr. Stewart's curve. As soon as the semilunar valves are opened by the intraventricular pressure exceeding the intraaortic pressure, this overdistension of the ventricle might pass off and give rise to a relative narrowing of the ring.

Dr. Barker asked whether the third sound has always been tone-like or has sometimes been like a noise or murmur.

Dr. Thayer replied that occasionally the third sound was a little prolonged and humming enough to be called a murmur.

With regard to the "opening snap" of mitral stenosis, Dr. Thayer said that he thought one should expect the sound to occur somewhat earlier, as the shortening of the chordæ tendineæ or, in advanced cases, the adhesion of the valves might result in earlier tension. As a matter of fact, in several cases, the time of occurrence of the early diastolic elevation of the cardiogram was essentially the same as in normal cases. In connection with Dr. Stewart's paper Dr. Thayer remarked that, in the hospital records, he had met with three cases of transient aortic insufficiency during typhoid fever, two of which he had observed himself.

III. The Anatomy of the Conductive System in the Mammalian Heart. Dr. Retzer.

The speaker showed with the aid of charts and diagrams the results of a study on the development of Purkinje fibers in the pig's heart. These are derived from the sinus that originates in the right and left venous valves and grow down in crescent shaped lamellæ into the lumen of the right atrium. The left venous valve attaches itself into the lumen of the right atrium to the atrial septum, while the right is divided into the Eustachian and Thebesian valves. The sinus fibers then grow down through the septum intermedium to the right and left sides of the interventricular septum, where they become histologically highly differentiated structures. The term sino-ventricular instead of atrio-ventricular bundle was suggested. The whole system is called the conductive system (Tawara), and is divided into the sino-ventricular bundle and the Purkinje fibers.

A description of dissections of the pig's, dog's, and human adult hearts followed. The fibers could always be traced to the coronary sinus. Histological sections show the presence of nerve fibers. The conductive system is not highly differentiated in its upper portion, and is characterized by the large number of nuclei which are always surrounded by a perinuclear space. Below the division of the right and left branches there are generally two nuclei found in the perinuclear space, frequently showing direct division. In the end ramifications, the Purkinje fibers proper, the nuclei are never found together but always near the border of the cells. These findings lead to the conclusion that the Purkinje fibers are the end result of a growth and signify specialization. The histological appearance of the cell together with the presence of nerve fibers leads to the conclusion that they are neuro-muscular organs, probably sensory in their nature. The speaker closed with an appeal to the physiologists and clinicians to cooperate with the anatomists to solve the problem of the heart-beat.

IV. Demonstration of the Interventricular Muscle Bands of the Adult Human Heart. Dr. Knower.

A specimen of adult human heart was demonstrated, in which the fat, coronary vessels, and epicardium had been removed to expose the superficial muscle fibers of the ventricles and of the conus. This superficial sheet was cut on the posterior surface, to the left of the posterior interventricular groove (sulcus longitudinalis posterior), and the right ventricle rolled away from the left after the method followed by J. B. MacCallum with pig embryos' hearts. The septum is thus split open, exposing the inner terminations of the muscle bands which arise superficially from the right and left atrio-ventricular rings and from the conus, and end in the papillary muscles of the left ventricle. Deeper fibers are also shown, extending from the left ring to the large papillary muscle of the right ventricle, and from the conus to this papillary muscle. The membranaceous septum is split, showing the position of the atrio-ventricular bundle of His in a novel and

striking manner. The right and left ventricles may be thus unrolled further until opened from the septal side, as done by MacCallum for young pig hearts. A fair proportion of hearts taken from dissecting-room subjects, preserved by injection of a carbolic acid, glycerin, and alcohol solution, and afterward kept for a time in cold storage or in vats of weak carbolic acid, are found to be suitably macerated for this demonstration.

The speaker thought that for the first time the results of Winkler, Pettigrew, Ludwig, Krehl and MacCallum are thus readily observed in the human heart.

It was urged that students should be induced to study the heart in this way, after working out the coronary circulation, etc., rather than simply to cut open the ventricles after the method used by the pathologist at autopsies, since these cuts destroy the important muscle connections. The tracing of the muscle bands between the right and left ventricle will furnish a valuable aid to the better appreciation of the action of the heart. The relations of the papillary muscles to the interventricular (and conus) muscle bands can hardly be understood without this dissection.

A more extended illustrated account is now in progress.

NOTES ON NEW BOOKS.

Nursing the Insane. By CLARA BARRUS, M. D., Woman Assistant Physician in the Middletown State Homeopathic Hospital, Middletown, N. Y. *New York: The MacMillan Company, 1908.*)

Nursing the insane is at last becoming established on the firm foundation of education and special training. For many years the idea of such training was not favored by many of the medical men who were charged with the treatment of insane patients in institutions. There seemed an impression that the nurse for an insane person was a heaven-born genius and needed neither education nor training. In fact in the minds of some there seemed to be a fear that any form of education would dim the lustre of her powers and impair her usefulness, precisely as we still hear objections to over-education and over-training in other fields of nursing. Although some persons still seem to prefer a greater or less degree of ignorance in a nurse it is gratifying to witness the decadence of this superstition and to observe the painstaking efforts which have been made in the institutions of New York to give an adequate training to mental nurses.

The book under review is written for hospital nurses rather than for nurses who have the care of insane patients in private houses, and hence has limitations which give it a specialized character and some of the features of an attendant's manual. Still even this has an advantage in that it brings the author into more intimate relations with her readers and permits a personal touch which is often very effective. The introductory talk to nurses in the second chapter is well conceived and gives the key-note of the book;—kindness, thoughtfulness, tact, and kindly consideration for the feelings of the patients are constantly urged by the author as essentials to success in nursing the insane. The injunction, "Never command or coerce when you can persuade" pervades the whole book. The chapters entitled the "Reception of Patients," the "Hygiene of Wards," etc., the "Care of Bed Patients," "Bathing and Hydrotherapy," and "Practical Points in Nursing" are very valuable and suggestive. They should be diligently studied by all general hospital nurses because they may at any time be called upon to assume the charge of similar patients. There is also a chapter entitled "Occupation and Amusements of Patients" which contains much good sense and many excellent hints.

The portion of the book which treats of "Psychology," "Mental Hygiene," and "Forms of Mental Disease" is painstakingly written and clearly expressed. It is, however, open to the objection of being too diffuse and somewhat above the capacity of the class of students for which it is designed. This error, if it is an error, is in the right direction and tends to make better trained nurses than is possible where a book furnishes a minimum of knowledge or a few stereotyped definitions. These chapters ought to excite thought and stimulate an interest in the study of normal and abnormal mental states. The book as a whole is to be highly commended.

The Thermal Death Points of Pathogenic Micro-organisms in Milk. By M. J. ROSENAU, Director Hygienic Laboratory. Hygienic Laboratory, Bulletin No. 42, January, 1908. Treasury Department, Public Health and Marine Hospital Service of the United States. (*Washington: Government Printing Office.*)

The Bulletins issued by this laboratory are of great value, and this last one is an important addition to "No. 41, Milk and Its Relation to the Public Health, by Various Authors." Dr. Rosenau's work is recognized as being authoritative, and his study on thermal death points will relieve much anxiety in the public mind as to the dangers of milk as a food, when proper precautions are taken. His conclusions are, in a few words, that, if milk is heated for 20 minutes to 60° C. (140° F.) such organisms as the tuberculosis, typhoid, diphtheria, cholera, dysentery, and Malta fever germs are rendered innocuous so far as conveying infection is concerned. His experiments have been carried out with much care, and he is able to demonstrate why the work of previous authors on thermal death points has been so contradictory. The problems that are being solved at the Hygienic Laboratory are most important ones for public health, and Dr. Rosenau's work is of that careful common sense character that gives distinction to these government productions. R. N.

Report on Plague in Queensland 1900-1907 (February 26, 1900, to June 30, 1907). 1907. Queensland: Department of Public Health. By B. BURNETT HAM, M.D., etc., Commissioner of Public Health. (*Brisbane: By authority George Arthur Vaughan, Government Printer, 1907.*)

This publication is an extensive report of eight separate epidemics of plague which occurred in Queensland in the period from 1900 to 1907 and affected a number of centers of population of which Brisbane was the most important. In addition to clinical and bacteriological studies of the plague cases, and the institution of general sanitary improvements, especial attention was devoted to a study of rats and the carrying out of measures for their destruction. While the work in Queensland was undoubtedly affected by and to a certain extent modeled after the work of the Indian Plague Commission, the Commissioner of Public Health points out that early in the study of the plague in Brisbane, the theory of the conveyance of the disease from the rat to man by the rat-flea was discussed by the investigators there and its possibility entertained. The various species of rats in Queens-

land and their insect parasites were carefully investigated during the several epidemics and a number of measures adopted for the extermination of the rat population. It is interesting to note that the Danycy virus consisting of cultures of a micro-organism especially virulent for rats, causing in them a fatal septicæmia, proved quite inefficient in diminishing the number of rats, even when spread about in rat-holes in considerable quantity. The volume contains a great deal of valuable information, especially well-illustrated by an extensive series of charts and maps.

The Etiology and Epidemiology of Plague. A Summary of the Work of the Plague Commission. Price, 10 cents. (*Calcutta, India: Superintendent of Government Printing, 1908.*)

The main results of the investigations of the Indian Plague Commission have already been reported in several numbers of the Journal of Hygiene and the general medical public is familiar with the conclusions reached by this body of scientific men.

The present volume is a short synopsis of their conclusions and has been compiled by Major George Lamb and published by the Government Printing Office at Calcutta. It is intended for general distribution among medical men in India, and in other countries where plague is epidemic. The pamphlet is divided into nine main parts, of which Part III, dealing with the method of transmission of plague infection from rat to rat and from rat to man is the most important. The rôle of the rat-flea in this transmission is emphasized and the various clinical and experimental facts leading up to the present conception of the etiology of this disease are well presented. In addition to the particular rat-flea *Pulex cheopis*, which is the demonstrated carrier of the plague bacilli, three other species of rat-fleas, *Ceratophyllus faseiatus*, *Pulex felis*, and *Pulex irritans* were also studied, successful experiments in transmitting the disease being observed in the first and the third of these latter insects. The general conclusions of the commission are that the pneumonic variety of plague, while highly contagious, occurs in but 3 per cent of all cases and has little to do with the spread of the disease. The bubonic type occurs in 97 per cent of all cases and is entirely dependent upon the infection in rats, and is conveyed from rat to rat and from rat to man solely by the rat-flea. Other points of importance brought out are that a case of bubonic plague is not in itself infectious, that unsanitary conditions have no relation to the occurrence of infection except as they favor infestation by rats, and that the non-epidemic season is bridged over by acute plague in the rat, accompaned by a few cases in human beings.

Lectures on Diseases of the Nervous System. Third series. The Border-land of Epilepsy, Faints, Vagal Attacks, Vertigo, Migraine, Sleep Symptoms, and Their Treatment. By Sir William R. Gowers, M. D., F. R. S., etc. Price, $1.25. (*Philadelphia: P. Blakiston's Son & Co., 1907.*)

No neurologist can afford to leave unread this series of lectures in which Dr. Gowers discusses with his well-known lucidity and ability a mass of most perplexing symptoms. It is the distinguishing trait of a great physician to be able to analyze and group obscurely related symptoms, and in this small volume Dr. Gowers shows his mastery of the various problems in epilepsy and allied affections. To his analytical skill he adds a charm of presentation of the subject, which is seldom found except in English writers, so that this work entices the reader as a good novel. In it one finds many happy sayings, as, for instance, "a conception [hysteria] which conceals whatever it covers" and again "to dismiss it as an hysterical fancy is simply to push it out of sight with the foot." Dr. Gowers' very large experience in the rare conditions described is evidence by the numerous case-histories he relates, and for this reason every student of nervous diseases must acknowledge his indebtedness to the author, and give a hearty welcome to these lectures. R. N.

Kirkes' Handbook of Physiology. Revised and Rewritten by Charles Wilson Greene, A.M., Ph.D., Professor of Physiology and Pharmacology, University of Missouri. Sixth American edition with 507 illustrations. (*New York: William Wood & Co., 1907.*)

The writer who attempts to correct and recast a text-book of which the chief merit is its popularity, is likely to be only partly successful, as the reviewer knows from personal experience.

Those who are acquainted with Kirkes' text-book will find in the new edition by Professor Greene many important improvements, but those who lack this historical perspective are likely to complain of certain defects. Many will wish to have the histological material still more reduced, and the laboratory exercises omitted altogether. Moreover, there is still some awkwardness of expression, some facts and cuts insufficiently explained, some statements of a misleading character, some unfamiliarity with recent literature and an apparent lack of coordination between the parts. Indeed, there is a great deal more to be done before the book can be regarded as really first class, but nevertheless the improvements already made lead us to look forward with some degree of confidence to the next edition.

Percy M. Dawson.

Twenty-third Annual Report of the Adirondaek Cottage Sanitarium, Saranac Lake, N. Y., and a Medical Supplement. By Lawrason Brown, M.D. Prepared in accordance with the suggestions of the National Association for the Study and Prevention of Tuberculosis. 1907.

The work being done at this sanitarium is of world-wide interest, conducted, as it is, by one of the ablest students of all the problems relating to the question of tuberculosis, Dr. Edward L. Trudeau. He has gathered about him a corps of active, energetic, enthusiastic, and capable doctors, to whom is due much of the success of the sanitarium. The statistics presented by Dr. Brown are among the most valuable that we have in regard to tuberculous patients treated at the sanitarium, and in a few years, it is to be hoped that conclusive deductions may be drawn from them in regard to many points of treatment and climate. As yet the number of patients that have been treated is too few to determine any facts accurately. During the past year a change has been made in the method of admission of patients to the sanitarium, and now patients are admitted in sequence, as they apply, no matter what the stage of their disease may be; heretofore only incipient cases were received. There is no disease of which it is harder to collect accurate statistics, and none for which such statistics are more desirable. As Dr. Trudeau states in his report, the labor of collecting these is very great, but it is to be hoped that he will be able to continue to gather them, and to analyze them still further. He and his co-workers deserve strong support from the public, and in his endeavors to solve some of the problems of tuberculosis he should not be hampered by lack of funds, but should be generously aided by those who are easily able to give, for tuberculosis or consumption kills the rich as well as the poor. R. N.

The History of the Study of Medieine in the British Isles. The Fitz-Patrick Lectures for 1905-6. Delivered before The Royal College of Physicians, of London. By Norman Moore, M. D. (*Oxford: At The Clarendon Press, 1908.*)

In this work Dr. Norman Moore gives us the results of a careful persevering investigation on the history of the study of medicine in Great Britain. The first lecture takes up medical study in London during the Middle Ages, and deals especially with the work of John Mirfeld, a physician in London in the reign of Richard II. In this he gives interesting notes found in old manu-

scripts which bear on the part taken by physicians in the earlier period of English history. He discusses especially the writings of Mirfeld, who wrote a treatise on medicine, called "Breviarum Bartholomei." At this time the practice of medicine was sometimes in the hands of a layman, sometimes of a churchman. Mirfeld was a resident in the priory of St. Bartholomew, which was closely associated with the hospital of the same name. Mirfeld gives accounts of many cases of various kinds and treats of the diseases of different parts of the body in a more or less systematic way. Dr. Moore points out that in certain parts of the work he has followed the arrangement in the "Rosa Anglica" of John of Gaddesden. The last chapter of the work, on the preservation of health, is based on the regimen of Salernum.

In the second lecture the methods of education in London in the 17th century are taken up, and for this Dr. Edward Browne, son of Sir Thomas Browne, is taken as an example. Dr. Moore speaks of some of the leading men in medicine in the latter part of the 16th century, and draws attention to the influence exercised by certain of them who devoted a good deal of attention to zoology, and hence were likely to apply scientific methods to medicine. At this time the College of Physicians was the body which stood most for medical learning in England, even more than the universities. Many records of Edward Browne have been left, especially a number of his note books, and from them one can obtain a fairly good idea of the work which he did.

In the third and fourth lectures Dr. Moore takes up especially the development of the study of clinical medicine in the British Isles. He draws special attention to the influence of the work of Mayerne, Glisson, and Sydenham on clinical study in England, and the influence of Boerhaave in Scotland and Ireland. Mayerne left an account of the fatal illness of Henry, Prince of Wales, in 1612, from which, as Dr. Moore has shown elsewhere, by careful study it is easy to recognize the disease as typhoid fever. He also drew up, in 1623, an account of the health of James I. This is preserved in the British Museum. From this we may gather that the royal patient was not always easily handled, and suffered from many maladies. In the appendix there are a number of interesting documents given in full, among which of special interest is a description of Harvey's notes, written in a copy of Galen.

The production of this book must have required an immense amount of patient search in many quarters. Dr. Moore is to be congratulated on the interesting result which has brought together much information which otherwise would remain unknown. One point of interest in the history of medicine in Ireland is that in certain families, medicine was an hereditary profession, just as law and literature. The tracing of the paths of influence of certain men, especially Boerhaave, opens a question which should be more widely studied, especially in this country. Much of the early influence in America came from Edinburgh, which was in turn indebted to Boerhaave. We have to thank Dr. Moore for making available such a valuable amount of medical history.

Mortality Statistics, 1906. Seventh Annual Report Department of Commerce and Labor, Bureau of the Census. S. N. D. NORTH, Director. (*Washington: Government Printing Office, 1908.*)

The collection of accurate mortality statistics is one of the most difficult tasks for any government to undertake, and but few recognize why it is so difficult. It would seem to be easy to learn just how many persons died in one year in any locality, but due to different methods of registration this is not so simple as it looks at first sight. The next problem is to classify deaths under the names of diseases, and herein lies the essential importance of the statistics, and at the same time the extreme difficulty of the work. Doctors are ignorant as well as learned, and both classes are careless, and even the learned do not always agree when they meet together, with the result that the causes of death as certified are almost impossible of classification. These are but a few of the major complications in this work, and the minor ones are innumerable. The statistics for the United States are the hardest to collect for the reason that many towns and more than half the States have no proper forms of registration, so that in this volume there are records of only 16 States, an increase of 6 since the report of 1900. But these 16 States represent very nearly 50 per cent of the entire population. The government report deals only with those States which are accepted as registration States. The value of the statistics may, however, be judged from the fact that in the area registered there were 658,105 deaths for the year, and this number "is not exceeded by any number returned to any national office in the world, except that of France, Germany, Italy, and Japan, not including Russia, for which country no data have been available for several years." Such incomplete figures as these are of immense value from their size, and little by little as the cities and towns organize their registration bureaus and the States are enrolled, the American statistics will become of vital importance. The work already done deserves the utmost praise.

R. N.

Hernia—Its Cause and Treatment. By R. W. MURRAY, F. R. C. S. Price, 4s. 6d. (*London: J. & A. Churchill, 1908.*)

This book is devoted to the somewhat belated and rather forlorn task of establishing the saccular theory of hernia as a complete explanation of the condition, to the absolute exclusion of a consideration of muscular weakness as even a contributory factor. The idea that herniæ are due primarily to congenital weaknesses in the peritoneum, that intestinal protrusions take place only in such preformed sacs, that the condition of the muscles protecting the canals where herniæ are found is of quite secondary importance, and that practically all herniæ are therefore congenital, is no new one; it is here advanced and defended with enthusiasm. Not, however, with any great success. No one denies the importance of peritoneal pouches in the etiology of hernia nor the necessity of treating the sac carefully in its cure; but this is by no means to say that the surgeon may neglect the muscular structures and attend only to the peritoneum. Any one who has dissected out the dilapidated inguinal canal accompanying a large, long-standing hernia in an old man will need little argument to make him feel that this state of affairs is partly responsible for the condition; and when he has seen herniæ recur after the most careful treatment of the sac, he feels perfectly sure that, in certain cases at least, such treatment *alone* is insufficient. It is of course well-recognized that simple herniæ are cured by simple operations; but it is unfortunate that such books as this one should attempt to show, and to appeal to Kocher for support, that a simple operation is sufficient for all cases. The author has not quite the courage to stick to his position to the bitter end. "The repair of the stretched and weakened aponeurosis," he writes, "forming the inguinal canal is in the adult of considerable importance," and even in children he advises and practices suture of the divided aponeurosis "to restore the obliquity of the inguinal canal"; though just why this is necessary if treatment of the sac be of itself sufficient, does not appear. It seems a shame that in his worship of the fetish of "simplicity" he has allowed the recent advances of surgery to leave him behind and refuses to adopt, in all cases, the beautiful imbrication method of "repair of the stretched and weakened" muscles, now in vogue nearly everywhere, which has been abundantly proven to be as nearly certain in its results as can be asked.

The author's own results have been good: 1 death and 3 recurrences in 42 males over 40 years of age is not, however, an exceptional record; and it must be noticed that a rather naïve

method of selecting cases in considering results has been used. "I do not consider it right," Mr. Murray writes (p. 69) "to include this class" (large herniæ in elderly persons) "in discussing the question of a radical cure, for if an operation be deemed necessary, it is performed merely with the view of permitting a truss subsequently to control the hernia, and with no serious intention of effecting a radical cure." This paragraph needs no further comment than quotation. J. C.

Manual of Surgery. By Alexis Thomson and Alexander Miles. (*Philadelphia and London: J. B. Lippincott Company, 1908.*)

This is another example of British "Manual Dexterity"; and one cannot but marvel at the ingenuity which contrives to condense within so small a compass such a fund of information. Almost every surgical fact finds mention here; though it would be unjust to expect that much more than this be accorded any except the most important subjects. The book compares favorably with Walsham—itself a masterpiece of condensation. In reading both, one is reminded of Billroth's advice to Miculicz about writing surgical manuals—"make the students think surgery is quite simple and easy."

The question of the justification for writing this sort of book at all is an entirely different problem. No doubt students find them useful; and in countries like Great Britain where examinations are an institution and cramming an industry, "surgical manuals" and "vade mecums" must be considered among the literary staples. They can hardly, however, be regarded as belonging to serious surgical literature. J. C.

Department of Neurology. Harvard Medical School. Vol. III. (*Boston, Mass., U. S. A., 1908.*)

The ten papers in this volume are "Contributions from the Massachusetts General Hospital, the Boston City Hospital, the Long Island Hospital, and the Neurological Laboratory." Eight have appeared during 1907 in the Boston Medical and Surgical Journal, one in the Review of Neurology and Psychiatry, and one in the American Journal of Medical Sciences. Six are by C. W. Taylor, one written with R. U. Smith; two are by J. J. Putnam, and two by P. C. Knapp. The majority of the papers treat the problem of a single nervous disease or symptom, while the remainder are of a more general character, as, for example, "Medical Expert Testimony" and "The Attitude of the Medical Profession toward the Psycho-therapeutic Movement" and "The Treatment of Psychasthenia;" these last two articles will doubtless interest many readers who have heard of what is being done in Boston in psycho-therapeutics. R. N.

The Development of the Leishman-Donovan Parasite in Cimex Rotundatus. Second Report. By Capt. W. S. Patton, M. B., I. M. S. Scientific Memoirs, Government of India, N. S., No. 31. (*Calcutta, 1908.*)

Following the previous report in which the author advanced the hypothesis that the parasite was probably transmitted by some blood-sucking insect, and showed in fact the presence of these organisms in the head-louse and bed-bug, he has given a detailed study of the development of the parasite in the Indian bed-bug *Cimex-rotundatus.*

The author refers to the fact that the specific parasite is always found in the peripheral blood in the last stages of the chronic and in the acute forms of the disease Kala-Agar. He fed bed-bugs on such cases in which the parasites had been demonstrated and then studied the development of the parasite ingested in the midgut of the insect. The especially noteworthy points are that the males and females are alike blood-suckers. The parasites undergo complete development to the flagellate forms (trypano-some-like) in three days, although they may remain dormant in the midgut for several days before beginning to develop. Parasites undergo rapid multiplication by rosette formation in the bed-bug. There is no evidence of inheritance of parasites by the young of Cimex, though the nymphs begin to feed on blood almost at once and can therefore transmit diseases. The author thinks that these facts, with the prevalence of Cimex in the houses, explain the endemic presence of Kala-Agar. No development of the parasite takes place in *Pediculus capitis.* The monograph is accompanied by excellent illustrations of the stages of development of the parasite. T. R. B.

Bulletin of Iowa Institutions. Vols. VIII and IX, 1906 and 1907.

These volumes are published quarterly and are issued by the Board of Control of State Institutions, and the laws governing this board are to be found in Vol. IX. The papers contained in these two volumes, written by doctors and laymen, are of a miscellaneous character, but deal with problems which regard the welfare of the citizens, such as the care of inebriates, the insane, criminals, the feeble-minded, consumptives, epileptics, etc. A few of the papers are purely medical in character, as is to be expected when such problems are dealt with, but the majority are of a more general nature. They contain much of interest to all students of social problems, and to all students of American life, for a study of them reveals how these problems are being handled in one State where the population and conditions vary from those found in other States. Each State has its own problems to solve, and the publication of such reports is an aid in showing how difficulties may be met and wisely treated. R. N.

Piroplasma Canis and its Life Cycle in the Tick. By S. R. Christophers, I. M. S. No. 29, n. s., Scientific Memoirs by Officers of the Medical and Sanitary Departments of the Government of India. Two rupees or 3s. (*Calcutta: Superintendent of Government Printing, 1907.*)

This monograph deals with a subject which, while not of special interest to the medical zoologist, on account of its throwing light upon the life history of protozoa should be read by all interested in medical zoology and especially in proto-zoology.

The paper begins with a short general discussion of the piroplasma in general; then the geographical distribution of canine piroplasmosis and in this it is interesting to note that it has not been reported in North America. The symptomology and pathology are briefly discussed, followed by a full description of the morphology of the parasite.

Capt. Christophers has described cultural forms in the blood of young pups very similar to those seen in the early development of the parasite in ticks. A well-written chapter on dog ticks is given and this is followed by a most interesting chapter on the developmental cycle of *Piroplasma canis* in the tick. The author concludes that in *Rhipicephalus sanguineus* there are two means by which the infection is transmitted: (a) Through the egg; proved by experimental infection of dogs and by a study of the parasite in the tick; and (b) stage to stage infection. In both methods of infection the parasite goes through the same cycle of development. In hereditary infection the ova are entered by the parasite either in the ovary or in the oviduct and in the yelk become zygotes. The details of development strongly suggest a cycle of a sexual nature somewhat similar to the sexual cycle of the malarial parasite. J. F. A.

Green's Encyclopedia and Dictionary of Medicine and Surgery. Vols. IV, V, VI, and VII. Price per volume, $5.00. (*Chicago: W. T. Keener & Co., 1908.*)

Dr. J. W. Ballantyne, as editor, and his associates are to be complimented on their work, which is an important addition to

any medical library. The index and cross-references make its use easy, the print is good, and the volumes of a size easily handled. Some articles seem longer than necessary and others shorter than is wise, but no encyclopedia can ever satisfy the wants of every reader, and he who is not well pleased with this one, must indeed be ungrateful. The illustrations are sufficient in numbers, and, on the whole, they are of good quality. The size of the volumes can be fairly estimated by taking any volume for an example, as, for instance, Vol. VII in which there are 48 articles of more than 1000 words in length, 82 with less than 1000, but at least 10 lines, and there are 1100 short paragraphs or definitions. A number of new articles have been added. It would require much search through other encyclopedias, medical dictionaries, and journals, and books to secure the information found in this one so well-arranged as to make an admirable reference hand-book. It is in addition well up-to-date, and Dr. Ballantyne has evidently not shirked his responsibility as editor, but has striven to make this work authoritative and has succeeded therein.

R. N.

The Theory and Practice of Anti-Rabic Immunisation. By Captain W. F. HARVEY, M. B., I. M. S., and Captain ANDERSON MCKENDRICK, M. B., I. M. S. No. 30, n. s., Scientific Memoirs by Officers of the Medical and Sanitary Departments of the Government of India. Annas 12 or 1s. 2d. (*Calcutta, India: Superintendent of Government Printing, 1907.*)

While the basis of all methods of anti-rabic inoculation at present practiced, with the exception of the serum treatment, is the work of Pasteur, many modifications of his original plan of treatment have been introduced and are being used. A progressive tendency to dispense with the use of much attenuated material and toward the early employment of virulent cords is noticeable. The present volume is an endorsement of this tendency pushed to its logical conclusion. Pasteur believed the attenuation of rabic cords by dessication to be due to a quantitative diminution of the infective material, and Höyges has practiced extensively a method based upon this belief, of inoculation with dilutions of fresh-fixed virus. The treatment suggested by the authors is that of Höyges modified as to daily dose and duration.

The authors draw attention to the remarkable uniformity of results obtained by different methods of treatment. This is due to the fact that approximately the same amount of immunizing material is used. To demonstrate this the authors adopted an arbitrary basis of measurement (0.2 cc. of 1/100 emulsion of fresh-fixed virus = 1000 units), and estimated the relative infectivity of equal weights of cord dried for various periods of time, by the injection of progressive dilutions of the virus. These ratios having been obtained, the amount of infective matter contained in the Pasteurian scheme and that of Höyges was computed in terms of the arbitrary unit and shown to be about 25,000 in each case.

Transient paralysis and other nervous symptoms occasionally follow anti-rabic inoculations and are attributed, justly the authors think, to the treatment. These symptoms have commonly been explained by the assumption of a rabies toxin. The authors advance experimental and theoretical reasons for their non-belief in the existence of such a toxin, and explain the untoward symptoms as a manifestation of anaphylaxis engendered by the introduction of foreign proteid; namely, rabbit nerve tissue. Now the amount of infective material in the two methods of treatment compared was shown to be practically identical. In the method of Höyges, however, the amount of nerve tissue containing this material is relatively small in amount (fresh-fixed virus), and it is in this form of treatment that the untoward symptoms referred to are least frequently met with.

When rabic cords are dried, their loss of infectivity and of weight is shown to be proportional, and a relation between the water content and the survival of parasites argued.

The experimental work reported seems to have been well planned and executed, but in some cases not carried out sufficiently. For instance, the estimation of the minimum infection dose leaves much to be desired in accuracy, although the difficulties are manifest and the attempt is commendable.

The matter is well presented and will be of interest to those concerned with the investigation and treatment of rabies.

A. M. S.

Cancer: Relief of Pain and Possible Cure. By SKENE KEITH, M. B., F. R. C. S., Ed., and GEORGE E. KEITH, M. B., C. M. Price, $1.25. (*New York: The Macmillan Company, 1908.*)

There does not appear to be any satisfactory reason for the publication of this work, and it is a pity that the publishers should have lent their name to it. The book is printed in large type, and consists of the history of a few cases of cancer and sarcoma treated with a preparation of arsenic and iodin. There is a brief introductory and valueless chapter of reflections on the use of other treatments. The authors give the result of their medication which, except so far as pain was relieved, seems to have been of little avail, although they believe its efficacy quite remarkable. Arsenic in one form or another has long been used in certain cases of cancer, and it does not appear that the preparation of arseniate of iron, with cacodylate of iron, cinnimate of sodium, and iodipin in a 25 per cent solution of oil is any more efficacious than other forms of arsenic. It would have been better if the authors had published their results as an article in a medical journal, where it would have attracted more attention, and received the proper consideration of doctors and surgeons. Volumes of this nature are no honor to the medical profession.

R. N.

Glimpses of Medical Europe. By R. L. THOMPSON, M. D. Illustrated from photographs and from drawings by Tom Jones. Price, $2.00. (*Philadelphia and London: J. B. Lippincott Company, 1908.*)

It was not worth while to publish in book form these "Glimpses," which first appeared as letters in the St. Louis Medical Review, written while the author was travelling in Europe, and there is no reason why any one should buy the book. The binding is cheap in appearance, and hardly does the text, even though it be not worthy of a cover, credit.

R. N.

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CONTENTS.

PAGE

The Teaching of Pathological Physiology. III. Organs of Respiration. (Illustrated.)
By W. G. MacCallum, M. D. 215

Right Meso-Jejunal Hernia. (Illustrated.)
By W. G. MacCallum, M. D., and R. T. Miller Jr., M. D. 219

Abnormalities of the Pulmonary Blood-Vessels. (Illustrated.)
By Carl R. Meloy, M. D. 221

Tuberculosis of the Stomach; Tuberculous Cavities of the Liver; with Report of a Case.
By M. C. Winternitz, M. D. 223

A Case of Sigmoid Kidney. (Illustrated.)
By M. C. Winternitz, M. D. 229

The Relation of Bronchial Stenosis to Bronchiectasis. (Illustrated.)
By W. L. Thornton and J. P. Pratt. 230

On the Occurrence of Newly-Formed Lymphatic Vessels in Malignant Growths. With a Demonstration of Their Origin and Ingrowth in the Metastases of a Round-Celled Sarcoma. (Illustrated.)
By H. M. Evans, M. D. 232

PAGE

A Preliminary Report upon the Effects of Feeding Animals upon an Iodine-Free Diet.
By A. R. Dochez, M. D. 235

Changes in the Pancreatic Ducts, and Their Relation to Chronic Pancreatitis. (Illustrated.)
By M. C. Winternitz, M. D. 237

The Phipps Psychiatric Clinic in Connection with the Johns Hopkins Hospital. 241

Proceedings of Societies.
The Johns Hopkins Medical Society. 243
Exhibition of a Case—Ichthyosis Hystrix [Dr. Lord];—The Cause of the "Loco" Disease [Dr. Crawford];—Studies on Venous Blood-Pressure [Dr. Eyster and Dr. Hooker];—Hereditary Epistaxis Associated with Multiple Telangiectases of the Skin, Nasal, and Buccal Mucous Membranes [Mr. Hanes];—Relation of Tetany to Calcium Metabolism [Dr. MacCallum and Dr. Voegtlin];—The Results of the Use of Anti-Meningitis Serum (Flexner's) in the Johns Hopkins Hospital in 1908 [Dr. Sladen];—Hydrocephalus of Meningococcus Origin [Dr. Knox].

Notes on New Books. 245

Books Received. 247

THE TEACHING OF PATHOLOGICAL PHYSIOLOGY.

III.[1]

ORGANS OF RESPIRATION.

By W. G. MacCallum, M. D.

(*From the Hunterian Laboratory, Johns Hopkins University, Baltimore.*)

In the third session of this course, the aims and objects of which need not be again stated, the diseased conditions of the organs of respiration were selected for study, and attention was directed not especially to those conditions caused by infectious agencies which can be studied to far greater advantage at the autopsy table and in the wards, but rather to those numerous disturbances which are of a mechanical nature and which thus lend themselves to experimental study. Indeed with few exceptions these pathological or disturbed conditions form a large part of what we find described in the text books on physiology, so dependent is the physiologist on interfering with the smooth working of organs in order to learn from their behavior in adversity what they have really been doing in time of peace. So it is, too, with the anatomist who is so often found depending upon the study of abnormalities to teach him the normal and who finds that the school book pictures of histological structure, often so difficult to see, come out with startling clearness in a pathologically altered tissue.

Especially interesting in the mechanism of respiration in mammals is the arrangement of the structures which by their

[1] On the Teaching of Pathological Physiology, I and II, J. H. H. Bulletin, Aug. 1906, and Sept., 1907.

movements draw in and expel the air from the lung. It is needless to describe this mechanism here except perhaps in so far as to point out the variations in the enlargement of the chest in different regions which inevitably result from the shape of the ribs, and from the character and direction of the hinge about which they rotate. This is such that the increase in volume of the upper portion of the chest is largely in the antero-posterior direction since the axis of rotation of the upper ribs approaches a line parallel with the anterior surface of the body, for this axis is the line between the two articulations of the ribs to the centrum and the transverse process of the vertebra. In the lower ribs the articulation is between similar points but the transverse process is bent so far backward that the axis of rotation of the rib is more nearly perpendicular to the anterior surface of the body. Thus it happens that in the lower part of the chest the enlargement is chiefly lateral. There, too, the enlargement is far greater, because since any approach on the part of a rib to a position at right angles to the vertebra must enlarge the space it surrounds, the upper ribs hanging as they do much nearer that position than the greatly slanted lower ribs do not so greatly enlarge the enclosed space by a movement of a certain distance as do the more oblique ones. All this movement is associated with some forward movement of the sternum, but that seems not so great as the up and down movement of that bone. At least in dogs when the movement of various points on the sternum was recorded it was found that aside from the up and down movement the forward protrusion is slight anywhere but is much greater at the lower than at the upper end; at the angle of Ludwig it is perhaps least. The curves recorded from tambours attached at intervals of 4 cm. along the sternum show this well. Similar curves taken from the ribs laterally showed the greatest variation in the extent of the movements which change the volume of the thorax. It is difficult to describe briefly these differences and it would be even more difficult to represent them graphically as it was planned to do by means of a series of recording levers showing the curves simultaneously produced from all parts of the thorax. As pointed out by Tendeloo, it is apparent that the volume of the thorax changes least near the spine; laterally and especially low down in the thorax it varies most while antero-posteriorly the variation is relatively great in the upper part of the chest.

In watching the respiratory changes the impression is gained that the whole expansion of the chest is not synchronous but proceeds, as Hutchinson suggested, in a wave-like form from above downward. The muscular mechanism bringing about these movements may be studied by electrical stimulation of the exposed muscles although there is a difference between the results of such isolated stimuli and the concerted action of all the muscles.

To all this is added the synchronous action of the diaphragm which produces so great a variation in the volume of the thorax from below, pulling in the ribs in inspiration along its line of attachment, although at the same time by compressing the abdominal contents the lowermost ribs are forced out.

Through the opened abdomen one can follow the movements of the diaphragm, with its passive central tendon which is transparent enough to show the pale pink lung sliding up and down, following into the space opened by the contraction of the diaphragm away from the chest wall. The excursion is not a very great one, however, and if the pleura between the ribs be exposed the lung can be seen through it. There too it moves up and down a little, sliding on the pleura and adhering closely. It does not move far and apparently the movement is less marked as we pass upward, although this should be accurately measured.

The question then arises as to the effect which this great inequality in the change in volume, in different parts of the thorax, may have upon the changes in pressure in different regions. As is well known many efforts have been made to compare the intrapleural pressure in different parts of the thorax by the most various procedures and Tendeloo in his monograph discusses these and in effect bases most of his explanations of mechanical changes in the lungs upon the theory that certain portions of the lung are subject to greater variations of pressure than others. This subject will be discussed in detail by members of the class who devoted themselves especially to its study. That alterations in pressure in one part of the thoracic cavity need not be felt in other distant parts seems to be true to a certain degree and to depend upon the adhesion between the pleural surfaces which will slide easily upon one another but which do not transmit changes in pressure unaltered. This can be exemplified by a rubber balloon with wet surface inside a bottle which has a side neck. If the neck of the balloon be on a glass tube which passes through a tight cork in the bottle and air be sucked out at the side neck the whole balloon will expand. If, however, the wet surface of the balloon touches the walls of the bottle in such a way as to cover the orifice of the side neck and suction now be made there, the whole balloon will not expand but only that part which covers the mouth of the side neck, for the wall of the balloon sticks to the wall of the bottle and pressure is not lowered in the rest of the cavity of the bottle around the balloon. The experiments which were made to prove the different variations in pressure in distant parts of the thorax will be recounted in the paper mentioned. That this must necessarily result in differences in the degree of expansion of different portions of the lung is obvious and doubtless has its important bearing upon the well-known common apical localization of tuberculosis.

It is possible to study a number of mechanical disturbances of respiration such as occur frequently in human beings and these are interesting when the blood pressure in various parts of the circulatory system as well as the respiratory movements and thoracic pressure relations can be recorded. For instance, a pleural effusion produced by injecting water or oil into the pleura, disturbs the respiratory movements greatly, as is seen in the curves. Intrapleural pressure becomes positive and the

lungs are blanched and compressed while the arterial pressure sinks and the venous pressure is increased.

The general relations of the circulatory conditions to respiration can be made more striking by thus increasing the intrapleural pressure, say by introducing a quantity of air into the pleural cavity. Violent respiratory efforts follow which are of little avail since they do not expand the lungs. They are, however, associated with great waves in the blood pressure curves which are synchronous with the respiratory movements but may be due in part at any rate to coincident vasomotor stimuli. The expulsion of the air reduces the condition to the normal again and the old relations are restored. This experiment may be regarded as representing the conditions in closed pneumo-thorax but the types of valvular pneumo-thorax may easily be imitated by inserting a tube into the thoracic wall with a valve working only one way. Air soon accumulates in the pleura to such an extent that respiration is impossible. In this respect the condition in the dog differs from that in man, since except for the most delicate membrane the two pleural cavities are practically one and changes in pressure in one are immediately felt in the other. For the same reason it is difficult to represent open pneumo-thorax in the dog.

Inflation of the abdomen produced only a costal type of respiration with rather shallow respirations and no especial change in the circulatory relations.

Other mechanical obstructions to respiration were, however, readily reproduced and the symptoms studied. Stenosis of the trachea and valvular obstruction to the trachea or larynx such as might result from the presence of a pedunculated tumor, a loose diphtheritic membrane, or certain forms of paralysis of the vocal cords, give very characteristic changes in the respiratory movements which are so familiar that it is not necessary to discuss them here. The relations of the intrapleural pressure to these obstructions of the trachea are, however, interesting and will be separately described. It was found, as might be expected, that under some circumstances the obstruction in the trachea may raise the intrapleural pressure above that of the atmosphere. This has been much discussed by Aron and Reichmann in their efforts to determine the mode of action of cough upon the peripheral parts of the lung and bronchioles, and we lean toward the view of Reichmann that a positive intrapleural pressure can exist only when the intrapulmonary pressure is high and can therefore not aid materially in expelling materials from the terminal bronchioles.

Obstructions lower in the bronchial tract were productive of interesting results in some ways. A pea introduced into the bronchus of one lobe and impacted there by means of a contrivance devised by one of the class[2] completely obstructed the flow of air to that lobe. The position of the lobe which later became atelectatic could be recognized by auscultation and percussion and at the autopsy this was verified and the bronchus behind the obstruction found to be filled with a thick mucus. It is more difficult to produce partial obstruction of a bronchus, but it could be done by pushing a piece of rubber tubing into the bronchus by the aid of a device similar to that used with the pea. The results of this experiment are as yet incomplete but it is thought probable that dilatation of the bronchus and the portion of the lung supplied by it may arise behind this obstruction. The measurement and recording of the pressure in the bronchus behind partial and complete obstructions has also been undertaken by members of the class and will be detailed in a separate note. When the lungs are suspended by a tube open to the air in an otherwise tightly corked bottle and the air partly sucked out of the bottle the conditions in the thorax are approached. If now one bronchus be constricted and alternate rarefication and condensation of the air in the bottle carried out (respiration), the free lobes will alternately expand and contract but the constricted lobe will in addition continuously expand, which demonstrates the imprisonment of the inspired air. For this result it is necessary of course that the inspiratory force should be sufficient and that the time allowed for each expiration should not be too long. In many cases bronchiectasis and emphysema of the lungs seem to depend in part upon just such a condition.

It is difficult to produce emphysema in animals—its mechanical principles are included in the above experiments but it seems probable that other changes such as alterations in the elasticity or elastic strength of the lung tissue are necessary factors in the human cases in spite of the negative results which have been obtained by various investigators, who have stained and studied microscopically the elastic tissue in these lungs. Instead of this, one of the class is engaged in determining the elastic coefficient of a series of lungs at autopsy, including cases of emphysema, by measuring the intrapleural tension and then by means of a manometer, the elastic recoil of the lung itself when distended with various definite amounts of air or fluid. These results will also be detailed separately, but already it seems that the elasticity varies enormously in different lungs.

It is well known of course that emphysema is a common result of asthma in which there is supposedly a narrowing of the bronchi with respiratory distress and we have attempted to repeat the experiments of Brodie and Dixon who, recording their results by oncographic methods, succeeded in producing narrowing of the bronchi and consequent limitation in the expansion of the lobe of the lung enclosed on the oncometer, by stimulating the vagus or the nasopharyngeal mucosa. We could, however, in our experiment produce no change in the curve recorded from the lung, possibly because we used chloretone as an anæsthetic in order to avoid the ether or chloro-

[2] The pea was fastened on the point of a pin, the head of which was twisted into a loop into which a long wire was fastened. This was passed through a long glass tube slightly bent and of a caliber so small that the pea could not enter; with the pea thus held against the end of the tube the whole was pushed firmly into the bronchus through a tracheotomy wound and the pin then pulled out by means of the wire, after which the tube was removed.

form which they say destroy the activity of the bronchial muscles, or the nerve endings in those muscles. In this animal the stimulation of the vagi caused pupillary changes and protrusion of the eyeball and the intestinal musculature responded actively, but still it may be that other experiments without general anæsthesia would give positive results in the case of the bronchi also.

As to the distribution of emphysema the statements seem a little exaggerated to fit the theory; it is true that the edges of the lobes are generally more distended than the main body of the lung, but it is not so evident that the emphysema corresponds accurately with the variations in intrapleural and hence intrapulmonary pressure in different regions of the thorax as Tendeloo appears to believe. Nor could we support his theory as to the distribution of fluid in the lung in cases of *drowning,* i. e., that the less mobile portions of the lung receive the fluid while the air is drawn from those alveoli into the actively expanding marginal and peripheral ones. It is true that when an animal was drowned at the end of an experiment by plunging its head under blue gelatin the fluid was found especially in the paravertebral portions of the lungs, and the air in the anterior and marginal portions. But in another animal drowned with the same material, but while lying on its belly, the blue gelatin was found at autopsy almost entirely localized in the ventral and marginal portions of the lung, while the paravertebral parts were pale and air containing. Evidently it is a question of gravitation—the heavy fluid sinks to the lowermost parts of the lungs.

Œdema of the lungs proved as always an interesting and difficult topic. The only easily conceivable cause of general œdema of the lungs suddenly appearing and causing death or again disappearing to reappear sometime later in a bedridden person, is as Dr. Welch has pointed out, a disparity in the activities of the two ventricles such that a *progressively increasing* amount of blood stagnates in the pulmonary circulation. This condition is not produced by a valvular lesion of the heart for there a constant amount of blood stagnates while a decreased amount circulates. Nevertheless it is possible, in spite of the fact that by violent interference œdema can be produced in normal rabbits, that the long standing effects of valvular lesions, chronic passive congestion, etc., may be an important predisposing cause leading to œdema of the lung when the left ventricle finally fails.[3] This is suggested because it is known to be so difficult to produce œdema by mechanical means in the dog. This we attempted by throwing the left ventricle out of function gradually and slowly by making hypodermic injections of strong alcohol into its muscular substance until finally it became almost completely coagulated and stiff, while the right ventricle still contracted actively. In such a case curves taken from the pulmonary vein and the carotid artery showed a marked rise in pressure with strong pulsation in the pulmonary, while that from the carotid sank very low and almost completely lost its pulsation. The left auricle became turgidly distended with blood, but no œdema of the lungs resulted. The same result occurred in a rabbit after the same experiment. On the other hand in the course of some observations of the movements of the heart in another dog, death ensued from the development of a most striking gelatinous œdema of both lungs without any injury having been done to the heart and without any adequate explanation being found. It seems evident that there is still some unexplained factor in the production of pulmonary œdema.

Time did not allow of the detailed study of the relation of the nervous system to the respiratory organs, but it was possible to demonstrate the simple phenomena such as those which arise from the stimulation of various afferent nerves. Rather inconstant and irregular effects followed most of these experiments, but the stoppage of respiration by stimulation of the laryngeal nerves and by the sudden stimulation (in drowning) of the terminals in the pharyngeal and laryngeal mucosa was constant. Sneezing and coughing reflexes were also characteristic and the well known results of vagus stimulation were brought out. Stimulation of the cœliac plexus in our hands brought about stoppage of the respiration but by comparison with the results of others this must be an inconstant phenomenon. The modifications of respiration resulting from dyspnœa, asphyxia, etc., as well as those from hyperventilation are well known. Several efforts were made to demonstrate vasomotor nerves in the lung with the pulsating manometric tracing from the pulmonary vessels as the test object, but the stimulation of all nervous connections failed to give us definite evidence of their existence. The beautiful experiments of Eyster on the production of Cheyne-Stokes respiration by the elevations of intracranial pressure are familiar and are of great value in this connection.

The introduction of foreign materials into the lung by way of the trachea affords an experimental method for the study of pneumonoconiosis, and the injection of emboli into the jugular vein and thus into the heart and pulmonary arteries is instructive in connection with infarct formation, but these as well as the various types of pneumonia and bronchitis may be studied much better in the wards and at autopsy, and therefore little time was devoted to them.

Next year, if opportunity presents itself, the similar experimental study of another group of organs, probably the digestive system, will be taken up.

[3] A case recently seen at autopsy seems to throw some light upon this point. There was advanced stenosis of the mitral valve with consequent chronic passive congestion of the lungs. There had developed within the last few days of life fresh vegetations upon the edges of the old scarred valves, so large as to occlude almost completely the mitral orifice. The patient died with extreme œdema of the lungs. The conditions here seem to correspond almost exactly with those proposed by Dr. Welch.

EXPLANATION OF CURVES.

Curve 1. *Asphyxia with complete obstruction of the trachea.*—The uppermost tracing is from the jugular vein, the canula being nearer to the heart than the first valve in the vein. The second is from the carotid artery, the third from the trachea, the fourth from the thoracic wall (7th rib laterally), while the fifth is the base line.

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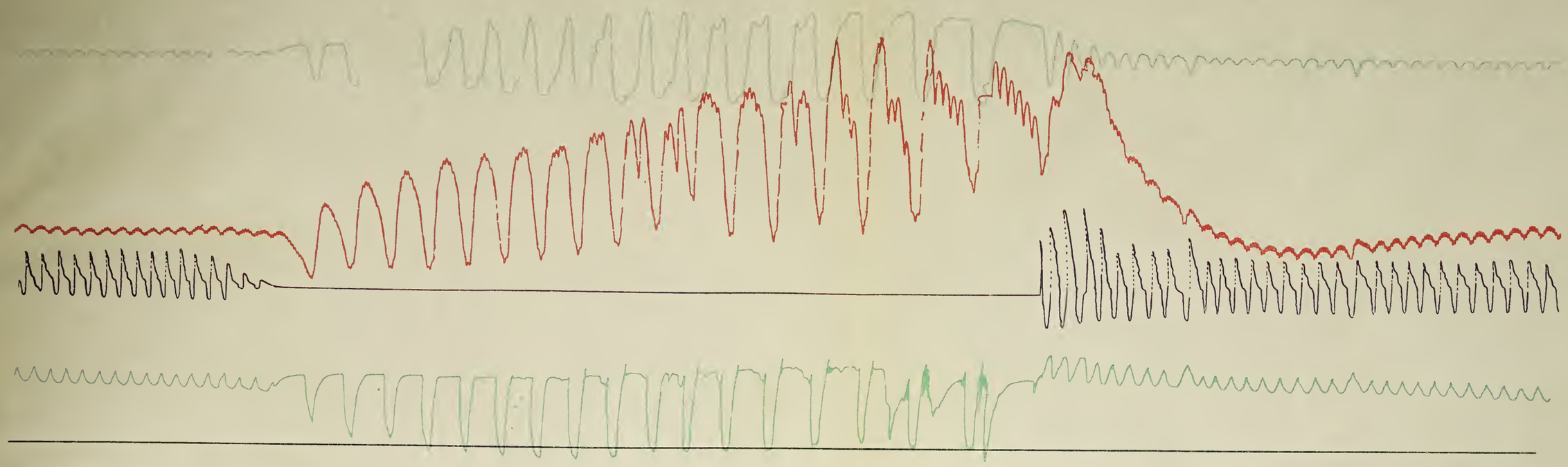

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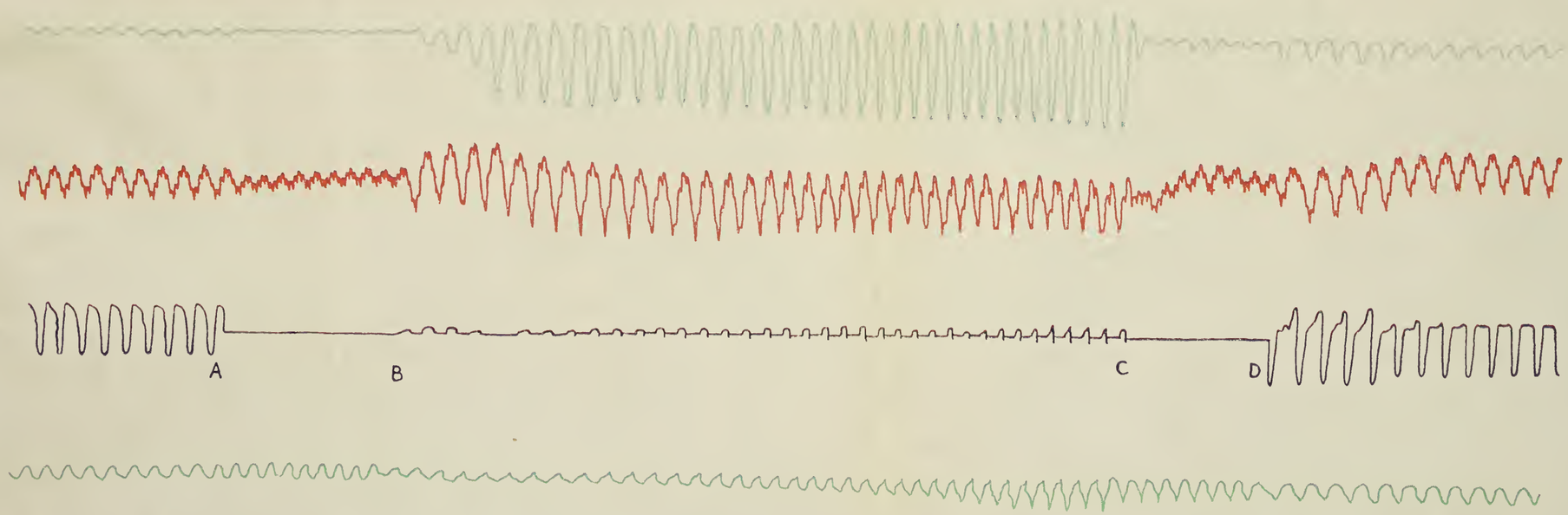

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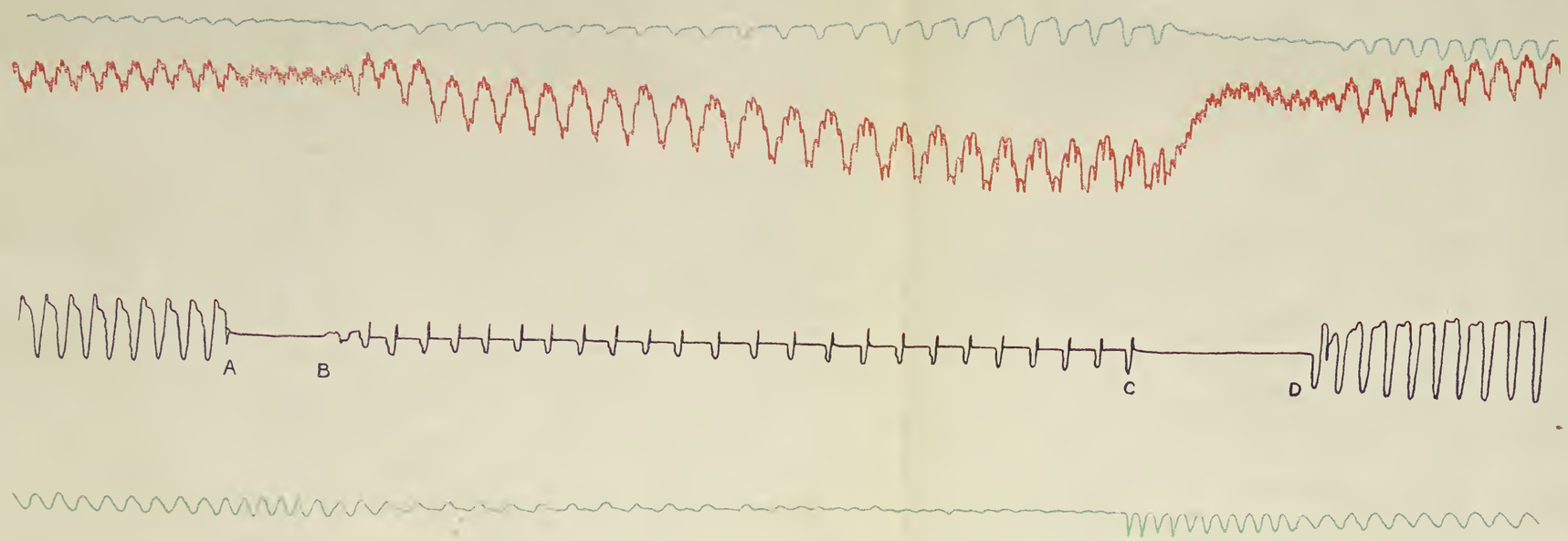

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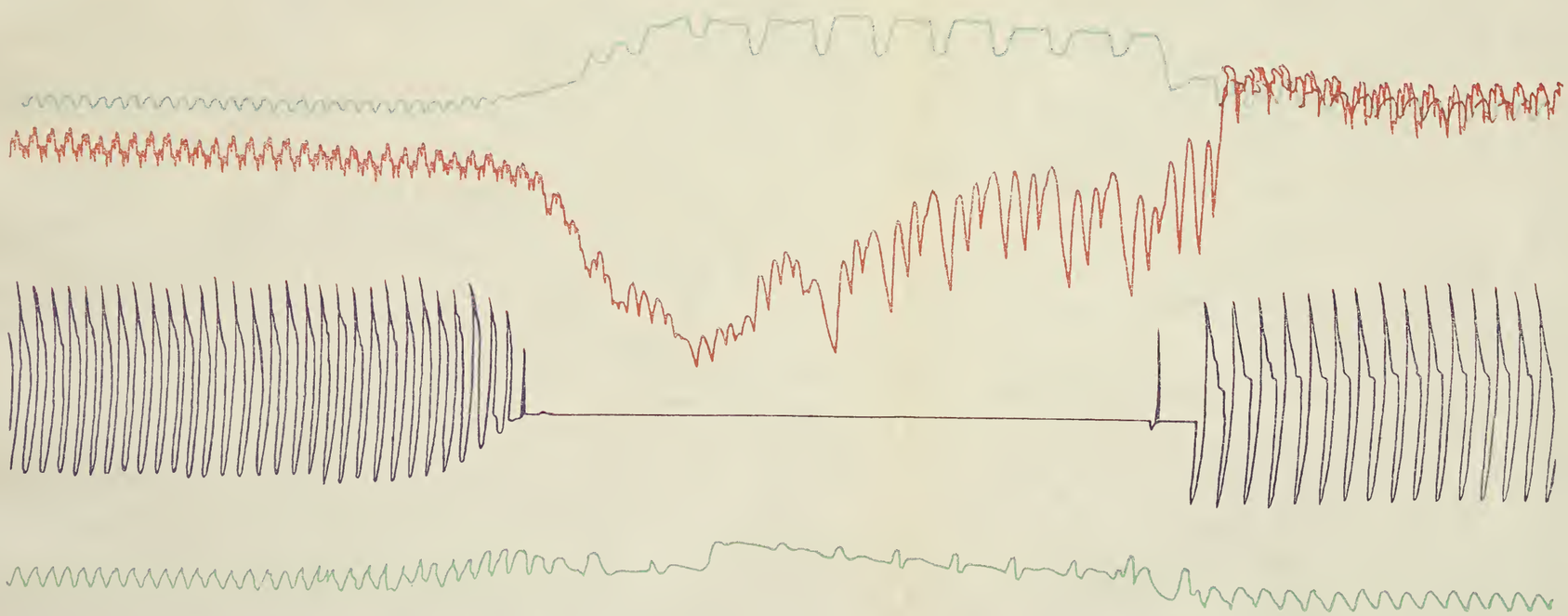


CURVE 4.

The respiratory record from the trachea ceases when the trachea is obstructed and almost immediately there begin prolonged inspiratory movements of the thorax with corresponding great waves in the arterial and venous blood-pressure. The maximum venous pressure appears a little later than that in the carotid. The pens are precisely superimposed in all the curves.

Curve 2. *Valvular obstruction of the trachea such that expiration only is possible.*—The recording apparatus constantly produces slight dyspnœa, which is relieved at *AB* and *CD*, while the valve is being inserted. At those portions of the curve the arterial and venous tracings are most nearly normal. The tracings correspond to those in Curve 1. At *B* the valvular obstruction is produced, the lungs gradually empty themselves as far as possible but the respiratory excursions of the thorax increase in amplitude. The change in pressure relations within the thorax produces large waves of arterial and venous pressure.

Curve 3. *Valvular obstruction in the trachea such that inspiration only is possible.*—The lettering and tracings correspond to those in Curve 2. At *B* the lungs begin to be distended by the imprisonment of air. As in Curve 2 this change in the air-content of the lung is not shown in the tracing. The respiratory movements of the thorax become more and more shallow, owing to the accumulation of air within it. Large waves appear in arterial and venous blood-pressure and the arterial pressure is lowered, while the venous pressure rises, and a condition of cyanosis and venous engorgement ensues.

Curve 4. *Pneumothorax rapidly produced by forcing air into the pleural cavity.*—The lungs become compressed and blanched and show no further respiratory movements, although violent and prolonged respiratory movements are made by the thorax. The amplitude of these, however, is slight, owing to the permanent distension of the thorax with air. In this respect the condition differs greatly from that seen in closed pneumothorax in the human being, especially in that the dog's thorax forms practically one large cavity. In this case there is marked elevation of venous pressure with large waves corresponding to and following the respiratory movements. The arterial pressure sinks to a low level, but gradually rises with great waves, due to respiratory movements.

RIGHT MESO-JEJUNAL HERNIA.

By W. G. MacCallum, M. D.,
Associate Professor of Pathology,
AND
R. T. Miller, Jr., M. D.,
Resident Surgeon, The Johns Hopkins Hospital, Baltimore.

The admirable book of Moynihan on retroperitoneal hernia renders any detailed discussion of the nature of the fossæ in the upper part of the abdominal cavity unnecessary, but the rarity of the particular type of hernia with which we have met in this region makes our case seem noteworthy.

It is made clear by a number of writers that there occur, with varying frequency, several fossæ about the duodenum and duodeno-jejunal flexure into which under certain circumstances the loops of the small intestine may pass sometimes to such a degree that an enormous sac is formed pushing toward the left but with its orifice facing to the right, capable of containing almost the whole of the small intestine. The particular fossa concerned may often be determined by the relation which the inferior mesenteric vein and the left colic artery bear to the margin of the orifice of the sac. Such herniæ are spoken of by Moynihan as left duodenal herniæ to distinguish them from others which originate near by but in a quite distinct fossa and project toward the right. These are designated by him right duodenal herniæ, although in truth, as will appear later, their relations to the duodenum are by no means so intimate as to suggest this name.

Moynihan in discussing the so-called right duodenal hernia reviews the previous descriptions of fossæ which might receive the loops of intestine and become distended into hernial sacs. In this review of the literature he refers especially to the last paragraph in Waldeyer's paper,[1] which is indeed of great interest so that we may copy his translation here. "Finally, I will refer to the importance of the mesenteric vessels in the raising up of peritoneal folds and the formation of fossæ. Especially is this the case with the superior mesenteric artery, as it arches downwards with slightly concave curve to the right. I have not seldom, in embryos, found a fossa in the mesentery in the concavity of this arch. When the artery is prominent the fossa may be as much as half a centimetre deep, with its closed end directed downwards. I have found this fossa four or five times in fifteen embryos of fifteen to twenty weeks. At a later period it seems to be flattened out. In the adult I have never met such a condition; but it is noteworthy that already many cases of hernia into the mesentery and through "rents" in the same are described, for which, perhaps, this condition may afford an explanation."

Further he refers to the paper by Brösike, who describes the recessus para-jejunalis which Moynihan regards as identical with Waldeyer's fossa. Brösike, in speaking of his case, describes the condition as follows (Moynihan): "In this case the duodenum and the flexura duodeno-jejunalis were normal. From the flexure the jejunum ran obliquely downwards and to the right, adherent to the posterior abdominal wall, and devoid of mesentery. At the level of the fourth lumbar vertebra the mesentery began. On lifting up the first free portion of the jejunum, there could be seen behind and to the right of it a fossa, bounded by a sharp peritoneal fold, which, for want of a better term, I call the 'plica para-jejunalis.' On introducing the finger into the fossa, it could be felt to push

[1] Virchow's Archiv, 1874.

its way between the mesentery and the posterior parietal peritoneum. There was no abnormality anywhere in the peritoneal cavity, but the free mesentery was strikingly long." He especially emphasizes the importance of the adhesion of the jejunum to the posterior abdominal wall in the formation of this fossa, but Moynihan shows that an analysis of the cases proves that this adhesion is not even of frequent occurrence.

From these descriptions it appears that there may occur on the left side of the mesentery at its root near the transverse portion of the duodenum, and hence in the portion subtending the upper portion of the jejunum, a depression or fossa hollowed toward the right and with its wide mouth opening toward the left. This is said to be more distinctly seen in children than in adults. Its anterior border is formed by the superior mesenteric artery, which arches over and in front of it. At its upper margin there may lie the duodenum; behind is the loose tissue forming the actual root of the mesentery. This is by no means so definite a saccular fossa as is commonly seen on the left side of the ascending portion of the duodenum or in the neighborhood of the cæcum but is rather a shallow concavity in the mesentery. If one lift up the loops of small intestine in the normal individual this region is usually found to be perfectly smooth and show no depression, but if the mesentery be viewed by transmitted light looking from right to left it is seen that there is at that point an extremely thin area, sometimes two such areas separated by a thicker band of tissue and sharply bounded anteriorly by the stout superior mesenteric artery with its accompanying veins, etc.

This can hardly be spoken of as a fossa, and indeed if this be the condition normally it is difficult to see by what force the intestinal loops could be pushed through that thin area. Evidently in all cases of hernia at this point there must be some disturbance which would give a chance for the bulging in of the intestines, possibly in the form of a rent in one leaflet of the mesentery which later develops into a fossa, possibly in some congenital laxity of this portion of the mesentery.

In all the cases described the sac bulges into the loose tissue behind the posterior parietal peritoneum, *i. e.*, stripping up in some cases the left leaflet of the meso-colon of the ascending colon, when it comes to lie mesial to the ascending colon; in other cases passing behind that portion of the intestine and stripping up the right or outer leaflet of the potential meso-colon so that the sac comes then to lie as in Brösike's case to the outer side of the ascending colon.

It seems quite possible, however, that instead of thus burrowing behind the posterior peritoneum the fossa might consist merely of a bulging of both layers of the meso-jejunum toward the right so that when the sac is complete it lies within, *i. e.*, mesial to the ascending colon, its walls or coverings being formed not of one layer of the meso-jejunum and one layer of posterior or parietal peritoneum but simply of the two layers of the meso-jejunum. Indeed, this seems to be what has actually happened in the case which we wish to report, as follows:

Case History J. G. Surgical No. 21,454. Colored, aged 41. Admitted October 19, 1907, complaining of abdominal pain and constipation. Immediate laparotomy. Findings: Incarcerated internal hernia. Reduction of hernia. Closure. Death in 28 hours, apparently due to acute cardiac dilatation.

Patient was admitted with the following history: Up to onset of present illness he had always been well. No history of previous attack.

Present Illness.—Onset one week ago, October 12, 1907, with acute crampy abdominal pain below the umbilicus, more marked on the left side. The pain has been almost constant since onset but there have been exacerbations. He first vomited October 15, the vomitus being thin, sour, and yellowish, but not fæcal; since then he has vomited once a day. His bowels moved slightly October 14, but have not moved since, in spite of moderate catharsis. There has been no pain on micturition. He has had morphia twice in the past 24 hours, ¼ gr. each time, and some previously.

Physical Examination.—Pulse 76 to the minute. Temp. (per rectum) 99.4°. Facial expression calm. Pupils contracted. Tongue coated with yellow fur. Abdomen markedly distended, the distension being more marked below level of umbilicus; distension equal on two sides. Abdomen moves very slightly with respiration, less in lower half than elsewhere. Intestinal loops plain but no visible peristalsis. Abdomen fairly soft, in spite of distension. Tenderness only slight and most marked in left lower quadrant. Abdomen is tympanitic as far as flanks, where there is about one finger's breadth of movable dulness. Liver pushed well up reaching 8 cm. from costal margin in right mammillary line. Rectal examination negative.

Note on Chest.—Expansion good. Percussion negative. Auscultation: "cogwheel" type of respiration. Heart: Systolic murmur at apex, not well transmitted to axilla. Other sounds clear. Area of cardiac dulness not enlarged.

Gastric Lavage.—Stomach washed out as a preliminary to the administration of ether. Over 1½ litres of a turbid, yellowish fluid obtained, very foul, but not stercoraceous.

Patient was evidently suffering from an acute intestinal obstruction from some undetermined cause and an immediate laparotomy was advised and performed. Patient had been given considerable morphia before admission, which complicated the anæsthesia to a certain degree.

Operation.—October 19, 1907. Ether anæsthesia.

Exploratory laparotomy for acute intestinal obstruction. Findings: Incarcerated internal hernia. Liberation of the hernial contents. No gangrene of bowel. Closure of sac.

A right rectus incision was made and the peritoneum opened, allowing the escape of a small amount of clear yellow serous fluid. Loops of bowel protruded into the wound; these were carefully packed off with Mikulicz pads and an exploration made. Lying exactly in the central portion of the pelvis directly between the rectum and the bladder was found a globular mass which was possibly 12-15 cm. in diameter, somewhat pear-shaped, with the small end upward. This mass was lying quite free within the peritoneal cavity, no adhesions about it at any point. It resembled at first touch a very much distended bladder but the patient had been previously catheterized and this was out of the question. A hard fibrous band was found running downward from the region of the epigastrium on the right side and into this mass. The mass was dislocated upward into the wound and was found to be a bunch of markedly distended small intestines lying within a hernial sac which was covered on both sides with peritoneum; the sac wall was extremely thin, about the thickness of tissue paper, and through its walls could be seen coursing a moderate number of veins of very small calibre. The condition was then recognized as being an internal hernia and attempt was made to reduce the contents of the sac. It was found easily pos-

The illustration shows the sac (*b*) as it appeared at the autopsy, its large mouth being represented at (*a*). The dotted line (*c*) is meant to represent approximately the outline of the hernial sac, as it appeared at operation. The para-jejunal fossa is clearly shown and to its left, at (*d*), the two blood-vessels cross each other to form the arch described in the text.

sible to dislocate these loops of bowel inward towards the mid line; that is, the mouth of the hernia sac pointed towards the mid line, the sac lying to the right-hand side. The sac was then turned inside out and loosely stitched in this position by transfixing sutures of fine black silk taken at the base of the sac. The contents of the sac were slightly adherent by old tough adhesions which were not divided as they were evidently not causing the acute obstruction. The intestines seemed in very good condition; there was no evidence of gangrene at any point, and the cause of the obstruction having been relieved, the wound was closed.

Post-operative Notes.—Upon return to the ward patient's respirations were only five to the minute and very shallow; pulse was 120. Patient was given a subcutaneous infusion of 1000 cc. of salt solution and his condition improved somewhat.

Leucocyte count four hours after operation, 8,400; 20 hours after operation, 11,000.

October 20.—Patient after operation complained of some pain in lower abdomen and was rather restless. Vomited several times after operation. At 1 a. m. his stomach was washed out and a quantity of yellow fluid obtained. Patient's bowels moved during the night. There was considerable distension over upper portion of the abdomen. Toward evening he complained of shortness of breath and his pulse was rapid and weak. When seen at 9 a. m. to-day, patient lay in bed, restless, with anxious expression and gasping for breath. Pulse rapid, 145 per minute (reached 160 at 8 a. m.) and weak. Examination of chest: Respirations labored; percussion negative; auscultation revealed a "cogwheel" type of respiration; a few râles toward right base, but otherwise negative.

Heart.—Deep cardiac dulness not increased. There is a definite systolic murmur over the apex which accompanies first sound; not well transmitted to axilla. Second sound clear. Pulmonic slightly accentuated.

Abdomen.—Much distended, especially upper half. Gastric lavage done and a large amount of yellowish mal-odorous fluid obtained. Patient given an infusion and stimulated with strychnine. He responded fairly well but gradually sank during the day and died at 7.25 p. m. The air hunger persisted all day.

Résumé.—Patient's bowels moved nine times between operation and his death. There was practically no abdominal tenderness and, except for the slight distension of his abdomen, there was no evidence of an intraperitoneal complication. Patient's pulse after operation increased steadily in rate, becoming progressively weaker, more thready and finally running; examination shortly before death seemed to show a moderate cardiac dilatation. Patient presented clinically the appearance of a cardiac collapse with loss of compensation.

Autopsy performed next day, No. 2950, was as follows:

Anatomical Diagnosis.—Hernia through the root of the mesentery, with strangulation; bronchopneumonia.

The peritoneal cavity was found to contain a small amount of blood-stained fluid, and the intestinal coils were slightly adherent to one another. They are extraordinarily distended, the upper coils of the ileum completely hiding the transverse colon. No definite obstruction was found. The mesentery of the jejunum is extremely lax and has been drawn up and sutured together so that no sac is actually visible. When these sutures are removed however the distensibility of the mesentery is such that almost the whole of the small intestine can be replaced in the sac. The adhesions formed about the mesentery of that part which was invaginated in this sac have been torn through.

The intestines were injected through the mesenteric artery with red gelatin and subsequently dissected. It is found that there is a very distinct para-jejunal fossa lying above the jejunum. This has a thick margin which extends over to the duodeno-jejunal flexure. The cord-like margin of the fold contains a band of muscle which can be frayed apart. This turns downward along the middle of the sac and runs to form the edge of a loose fold which might have bounded the superior duodenal fossa. There is a sac there which is more or less continuous with the main sac about to be described. In the communication between these two the inferior duodenal fossa is quite lost. The arteria-colica sinistra starts upward at about 2 cm. to the left of the lower margin of the para-jejunal fossa. It forms an arch in the meso-colon with the mesenteric vein, but the arch lies nowhere near the orifice of the large sac. Indeed, it is somewhat distant from the para-jejunal fossa, in the formation of which it plays no part. The relationship of this arch to the duodenal fossæ is in general not so definite as is described in literature. The duodenum is normal in its position. The jejunum is quite free and has a long mesentery. At its root the tissue becomes extremely loose and wrinkled and the peritoneum covering the duodeno-jejunal flexure suddenly assumes this same character and is continuous with the lining of the very large sac which projects through the mesentery of the jejunum toward the right. The mesentery of the jejunum is quite compact down to the main branch of the superior mesenteric artery which runs in it; that is, the branch which gives off anteriorly so many smaller branches to the mesentery, and which is accompanied by a large vein. Underneath this branch, which forms an arch, both leaflets of the mesentery become extraordinarily lax and are distended into a large sac which at the time of the operation projected far down toward the pelvis on the right side. It is thus seen that this sac is not made up by the burrowing of a stretched leaflet of the mesentery underneath and behind the posterior peritoneum as is usual, but is constituted simply by a distension of the two leaflets of the mesentery and therefore appears mesial to the ascending colon. The outer leaflet of the sac is continuous on the right with the posterior peritoneum running over to the ascending colon, and this is also extremely lax. The condition may therefore be regarded as a meso-jejunal hernia, although it is true that the duodenal fossæ are more or less involved in the sac and can no longer be clearly discerned as such.

ABNORMALITIES OF THE PULMONARY BLOOD-VESSELS.

By Carl R. Meloy, M. D.,

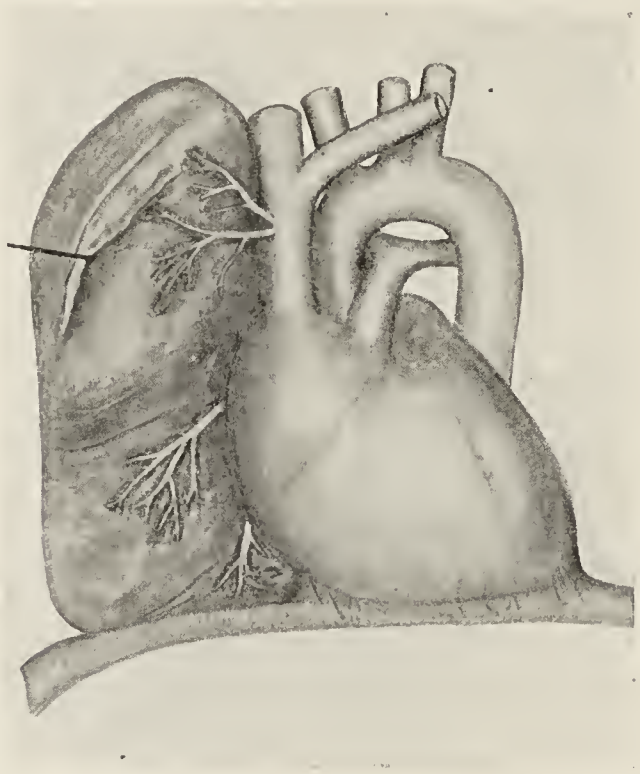
Assistant in Pathology, The Johns Hopkins University.

(*From the Pathological Laboratory.*)

As, after searching the literature for cases of abnormal pulmonary circulation, no cases were found, it seems of sufficient interest to report briefly two such cases.

The first case (Path. Museum, No. 1669) was obtained originally from the anatomical laboratory. The specimen consists of the heart and lungs of a child evidently about two years of age. The heart, which is dilated and hardened in situ, seems normal in every other respect. The large vessels

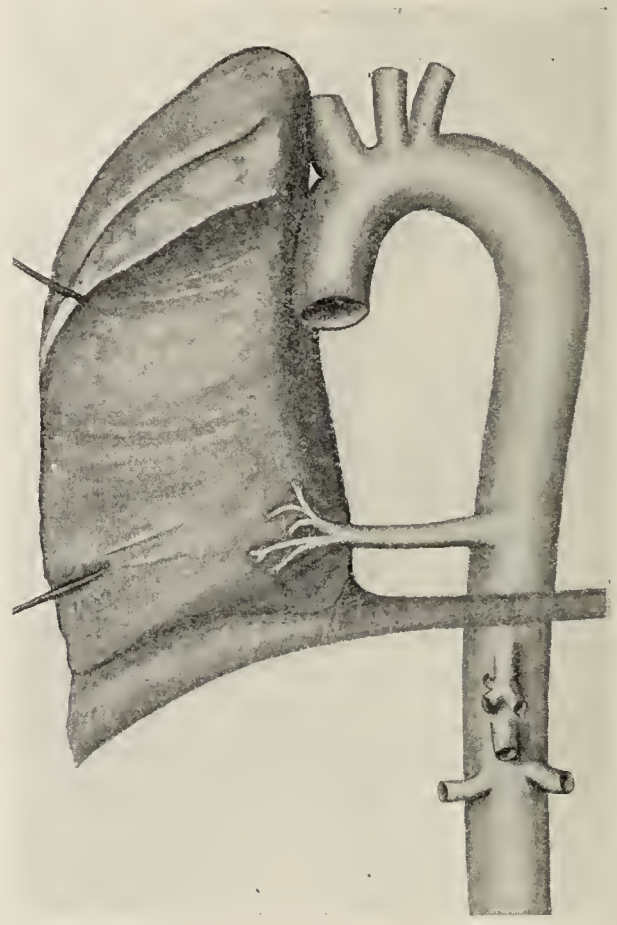
which enter and spring from the heart are normally situated. The pulmonary artery arises from the right ventricle and extends backward, to the left of the ascending aorta for a distance of about 2 cm., where beneath the arch of the aorta it divides into a right and left branch. The right branch bends very sharply to the right and, passing above the pulmonary veins, crosses the right bronchus and gives off two medium-sized branches which supply the upper lobe of the right lung. Two branches are then given to the middle lobe, and the artery ends in three branches to the lower lobe. The left branch of the pulmonary artery supplies the upper and lower lobes of the left lung with an equal number of branches. The left pulmonary veins arise in a normal manner from the upper and lower lobes of the left lung and run directly and separately to the left auricle, into which they empty. The veins from the middle and lower lobes of the right lung run directly and separately toward the right aspect of the left



auricle, and joining just before the auricle is reached, enter it as one large vessel. The striking abnormality present in this case is seen in the fate of the arterial blood from the upper lobe of the right lung. Arterial blood from this lobe is collected by numerous branches which join to form two larger vessels, which, in turn, converge toward the middle line of the body and very close together enter the superior vena cava at a point about 1.5 cm. above its point of entrance into the right auricle.

In the second case (Autopsy No. 2949), that of a white male, 80 years of age, the anatomical diagnosis was: Bronchopneumonia, chronic diffuse nephritis, arterio-sclerosis, thrombosis of middle cerebral artery, encephalomalacia, inguinal hernia, and anomalous pulmonary artery from aorta.

No abnormalities were noted in the structure or blood-supply of the left lung. An interesting coincidence in this case is that the right lung is incompletely divided into two lobes by a short shallow fissure which is situated about midway between the apex and the base and runs from the postero-lateral aspect obliquely forward for a distance of about 15 cm., and disappears upon the anterior surface. Upon removal of the right lung, a hard calcareous body was encountered upon the mesial aspect near the base. This is found to be an artery arising from the aorta at a point about 5 cm. above the diaphragm, and running directly over into the lower mesial portion of the lung. Here it breaks up into six large short branches which end quickly. These branches are distributed to an area of lung about 3 cm. in diameter. The artery is about 6 cm. in length and about 8 mm. in diameter. The lumen is completely obliterated from its origin to the point where it branches, by a firm gray thrombus. The walls of the artery and its branches are very thick and contain a large deposit of calcium salts. Since the thrombus appears to be very old, and the lung tissue in the area to which the small



branches are distributed is air-containing and appears normal, and since there is an extensive obliterating endarteritis in the small branches, it is very evident that the extra blood-supply to the lower portion of the lung was entirely superfluous.

In pig embryos 5 mm. long Flint [1] says that the pulmonary vein develops from the undivided portion of the sinus venosus at the level of the pulmonary anlage, and that as the stem bronchi increase in size, right and left pulmonary veins develop from the capillary plexus which surrounds them. These are formed upon the opposite side of the bronchus from the arterial capillaries. Thoma found in the chick that the arteries and veins are originally simple capillaries. Their growth in size bears a definite relationship to the velocity of the blood stream in them, while their arterial or venous nature is determined by the character of that current, a high pulsating column of blood giving rise to an artery, while a low-

[1] J. M. Flint. American Journal of Anatomy, Vol. VI, 1906.

pressure constant current would be the determining factor in the formation of a vein. The nature of the current would be dependent upon the position of a given capillary, whether it be upon the arterial or venous side of the capillary plexus. As to the cause of vascular development there is some dispute, Thoma believing that new growth of vessels is due to a rise in blood pressure in the vascular area, while Flint thinks that new growth of cells is the primary stimulus for the production of new capillaries. It seems very probable that both of these factors may play a part in vascular development.

In the first case above described, the abnormality has evidently occurred very early in embryonic life, probably just after the time of the vascularization of the eparterial bronchus. The venous character of the vessels in this case (*i. e.*, carrying blood away from the lung) was earlier determined, but the capillary buds, instead of passing like those from the middle and lower lobes to form a right pulmonary vein, have taken an abnormal course, entering the superior vena cava, mixing arterial with venous blood, thus causing more or less of a vicious circle.

In the second case no explanation can be offered, other than that the vessel described is an abnormal supernumerary one, which can bear no relation to the bronchial arches. Here the branches of the artery bear no relationship to the bronchi, and the area supplied by the artery at the time it carried blood was drained by the pulmonary veins.

TUBERCULOSIS OF THE STOMACH; TUBERCULOUS CAVITIES OF THE LIVER; WITH REPORT OF A CASE.

By M. C. Winternitz, M. D.,

Fellow in Pathology, Johns Hopkins University.

(*From the Pathological Laboratory.*)

This case is of interest on account of the localization of the tubercuious process, the extensive involvement of organs rarely affected by the disease, and finally for the possible light it may throw upon the etiology of the process in these organs.

F. B. Colored, female, æt. 20 years. Died December 7, 1907, 7.30 p. m. Autopsy December 8, 11 a. m.

Anatomical Diagnosis.

Broncho-pneumonia; tuberculous bronchial, anterior-mediastinal, and mesenteric lymphadenitis; tuberculous pleuritis; tuberculosis of the lesser peritoneal cavity with extensive adhesions between the liver and diaphragm, liver and stomach, stomach and pancreas; tuberculous cavities in the liver; tuberculous ulceration of the stomach; tuberculosis of the spleen; epithelial necrosis of the kidneys; fatty degeneration of the myocardium.

Body.—Is that of a fairly well-nourished negress, 145 cm. in length. The abdomen is slightly distended. The abdominal fat is well preserved. The peritoneal cavity contains a small amount, (200 cc.) of yellow fluid, in which a few flakes of fibrin are seen. The surface of the peritoneum, over the right rectus muscle, shows several small black shot-like nodules, 2.5 mm. in diameter. The meso-colon is studded, especially near the greater curvature of the stomach, with enlarged yellow opaque nodules from 2 mm. to 2 cm. in diameter. These vary in consistency, some are firm, while others are semi-fluctuant and expel on incision a yellowish, opaque, viscid fluid. The lesser peritoneal cavity is obliterated. The liver is bound down firmly to the diaphragm, the stomach is closely bound to the posterior surface of the liver, and the pancreas to the posterior surface of the stomach. The spleen likewise is adherent to the diaphragm, and parietal wall. The mesenteric lymph glands are large and on section no glandular substance is to be seen, but in its place a yellowish caseous mass. On removing the sternum a large amount of greenish yellow, viscid material exudes from the right side. This comes from a circumscribed, necrotic mass in the right pleural cavity, measuring 3 x 4 x 5 cm. (apparently broken-down lymph glands). Its base is formed by the diaphragm while laterally and posteriorly it is covered by a much-thickened pleura. Its walls are ragged and show a yellowish cheesy surface. Running up from this area a number of enlarged caseous lymph glands are found in the anterior mediastinum. The pleural cavities are partly obliterated by old fibrous adhesions.

Lungs.—The *left lung* is bound down firmly to the parietal pleura by numerous fibrous bands which bleed slightly on division. Here and there, over the roughened surface a few opaque yellowish nodules can be seen. The lung is voluminous, of a pinkish gray color, mottled everywhere by large irregular deep maroon areas. These are non-air containing. The glands at the hilum are not markedly enlarged. Several, however, show on section yellow opaque nodules in the black pulp. The bronchi exude considerable brownish frothy fluid. Their mucosa is reddened. On section the lung tissue is moist, of a pink color, and shows many irregular more congested areas which stand out above the surrounding tissue and have a finely granular surface. These are non-air containing. The *right lung* is likewise bound down by numerous semi-opaque adhesions. Its lower anterior surface is covered by the mass of broken-down lymph glands above described. Otherwise it resembles the left in every respect.

Spleen.—Is small, hard, and firmly bound down to the parietal wall. Its surface is covered by fibrous tags and shows several yellowish, opaque masses; the largest 2½ cm. in diameter. Throughout nodules 2 to 5 mm. in width, similar to the one described on the surface are found.

Note.—On account of the dense adhesions, the diaphragm, liver, stomach, duodenum, and pancreas were removed en masse.

Liver.—The dome of the liver is united to the under surface of the diaphragm, by a dense caseous mass, varying from ½ to 1 cm. in thickness. On its under surface the liver is bound closely to the anterior wall of the stomach, and on attempting to separate them the wall of the stomach is easily torn. On section the liver substance is of a pale grayish-brown color. It is studded, more especially in the portal areas, by opaque grayish-yellow nodules. Several of these show minute green centers. Several cavities are seen; two measuring ½ cm. in diameter, while a third is the size of a pigeon's egg, lying in the posterior portion of the right lobe. These contain a viscid creamy material which when evacuated leaves a ragged wall studded with yellow and green bile salts.

The *gall bladder* is likewise closely surrounded by fibrous adhesions. Its walls are thickened and show numerous tubercles over its surface. It is difficult to force bile through the common duct into the duodenum. The mucosa of the gall bladder shows numerous erosions with undermined necrotic edges. The common duct is patent and empties about 1½ cm. below the pancreatic duct into the duodenum. It is joined by a small duct from the head of the pancreas.

Pancreas.—Is adherent to the posterior wall of the stomach by a dense caseous mass. On section it shows no gross lesion; its ducts are patent.

Stomach.—Is small and as above described closely adherent to the liver and pancreas. The serous surface is roughened by opaque yellow nodules, from 2 to 5 mm. in width. Where it is bound to the liver, it is very friable, tearing readily. The stomach opened along the lower third of the anterior wall, contains a small amount of tenacious, grayish mucus. When this is removed, two extensively ulcerated areas, the one corresponding to the external adhesion with the liver, the other to those with the pancreas, are disclosed. The ulcers show a granular necrotic base on which opaque yellow nodules can be seen. The walls of these ulcers are greatly undermined so that in many places a blunt instrument readily passes beneath the bridges of mucous membrane and allows it to be lifted up as a lattice-work. On section through the stomach wall, it is seen to be markedly thickened. The sub-mucosa shows many yellow nodules which extend to the muscularis and even to the serosa. The mucosa is often intact over such a nodule, but in areas shows the ragged ulceration above described. The stomach wall, along both the lesser and greater curvatures, is pale and of a yellow color. The rugæ are still present. Here and there, a slight nodular area is seen which, on section, reveals a sub-mucous caseous mass. The cardiac orifice is small but the mucosa seems normal. The same is true of the pylorus.

Duodenum.—Is slightly narrowed by the projection of the œdematous villi. Its mucosa is congested, but otherwise it seems quite normal.

Intestine.—In the lower ileum and cæcum, several grayish opaque slightly elevated nodules, about 5 mm. in diameter, are seen. Otherwise nothing of note is to be made out.

Microscopical Notes.

Lungs.—The pleura is thickened markedly by a loose fibrous coat, throughout which many engorged blood vesels are seen. Toward the periphery, where the pleura was in contact with the broken-down lymph glands, there is a dense necrotic mass infiltrated with cells mostly of the polymorphonuclear type.

The alveoli are filled in patches by an exudate of serum, blood cells, mostly polymorphonuclear, fibrin, and a few desquamated epithelial cells. These are all well preserved. The bronchi are likewise filled with exudate.

Spleen.—The capsule is thickened. Typical conglomerate tubercles are found throughout the pulp.

Pancreas.—Except for a marked fibrous thickening attaching it to the stomach wall, it is apparently quite normal.

Stomach.—Shows in many areas, no sign of any tuberculous lesion. Here the mucosa is slightly infiltrated with fibrous tissue and there is a loss of its glandular elements especially in its outer half. There is no marked increase in either the number or size of the solitary follicles. The serosa shows areas of round cell accumulation and not infrequently epithelioid cells can be made out. In places streaks of similar cells come up through the muscularis forming nodules in the sub-mucosa like those on the serosa. Nodules as large as ½ cm. in diameter occur in the sub-mucosa, covered by intact mucous membrane. These are caseous degenerations surrounded by rounds cells and epithelioid cells, and often typical miliary or conglomerate tubercles occur. The muscularis and the muscularis mucosa may be intact about such a mass. Sometimes the muscularis is involved in the tuberculous degeneration and in the majority of instances, caseous areas are found on the serosa beneath the nodules. In fact the most extensive change in the mucosa and sub-mucosa occurs where the stomach is bound to the liver or pancreas, so that in a section one has first liver or pancreas, then exudate and then stomach. Where the mucosa is involved one sees ulcerations of varying sizes. The most typical ones are quite small with deeply undermined edges. The cavity itself being about the size of the nodules above described in the sub-mucosa. These seem as though they may have formed in the solitary lymph follicles. The base of the ulcers is lined by a caseous mass and the edges show many tubercles in various stages of formation. Often several smaller ulcers become confluent burrowing through the sub-mucosa and leaving the partially degenerated mucosa lying free over the necrotic base. Here and there giant cells and tubercles also occur.

Œsophagus.—The œsophagus shows an intact mucosa. The sub-mucosa, however, shows accumulations of round cells, but no coagulative necrosis. (This section was taken just at the transition of the pavement epithelium of the œsophagus to the glandular epithelium of the stomach.)

Duodenum.—Section of the duodenum, just below the pylorus, shows it to be quite free of any of the changes above described in the stomach.

Liver.—The liver is studded throughout with areas of degeneration and cellular infiltration. These are by far most prominent around the bile ducts. Everywhere one sees a granular exudate lying free in the lumen of the ducts. The epithelium is desquamated to a great extent, sometimes stripped off in entire sheets. Surrounding the bile ducts various types of change occur; in some places dense fibrous tissue forms a thick wall enclosing usually, besides the bile duct, also the vessels in the portal spaces; in others the fibrous tissue is not so dense and there are numerous round cells seen throughout it; in still others there is just an accumulation of round cells and epithelioid cells around the small bile duct. These latter often appear as so-called "pseudo-giant" cells. In other areas cavities of varying size can be seen lined by caseous degenerated walls and fibrous tissue surrounding them. In these cavities one finds constantly the remains of the duct epithelium, in long desquamated strands, and bile pigment. In tracing some of these cavities through serial sections, the larger ones do not connect directly with one large duct; however, numerous smaller ducts can be seen to be involved in the degenerative process and to gradually enter the cavity. One small cavity was found, which apparently arose from a single duct. Its epithelium, though desquamated, could be seen lying in one large sheet at the periphery of the cavity. (This same appearance was found in two other cases of miliary cavity formation in tuberculous livers.) A section of the common bile duct, close to where it empties into the duodenum, shows it denuded of its epithelium and numerous areas of round-cell accumulation occur in its wall. The liver tissue, between the areas of degeneration above described, is markedly congested, and shows in a few areas both miliary and conglomerate tubercles, but these are not abundant and rarely attain any great size.

The genito-urinary tract is entirely free of tuberculosis.

Tubercle bacilli.—After repeated efforts a few tubercle bacilli were found in both the gastric sub-mucosa and in the liver.

Although it is impossible to say where the primary portal of entry in this case was the involvement of the tracheal, bronchial and anterior mediastinal lymph glands with the chronic pleuritis seems to point to the upper air passages and the lymphatic system as the path. The diaphragm was probably invaded from the anterior mediastinum, and the ser-

ous surface of the liver, stomach, spleen, and peri-pancreatic tissues were involved by direct extension. That the stomach was involved from without, seems certain. As to the origin of the cavities in the liver, we have the involvement of the gall-bladder and bile ducts in favor of an ascending infection. It seems impossible, however, to rule out the lymphatics which may have carried the process from the peri-hepatic tissue. Strength is added to the last theory when we recall that the large cavity was situated in the posterior portion of the right lobe and at its nearest point was hardly 2 cm. away from the caseous capsule.

It will be of interest to note that among the cases of tuberculous cavities reported, many have been associated with a peri-hepatitis.

Tuberculosis of the Stomach.

Tuberculosis of the stomach is a rare occurrence. Simmonds in 1900, said "No case of *primary* tuberculosis of the stomach has ever come to autopsy." Glaubitt, in 47 cases, found two or more organs, besides the stomach affected in every case; the lungs were affected every time. Ruge, in a recent paper, reviews those cases where with a gastric tuberculosis, the lungs were uninvolved: (1) Hattute: case of miliary tuberculosis of the peritoneum, bronchial and mesenteric lymph glands; chronic pleuritis. (2) Kansow: extensive peritonitis. (3), (4) Petruschsky: diagnosed clinically (no autopsy). (5) Cazin: peritonitis, ulceration of larynx and involvement of bronchial glands. (6) His own case, where there was an extensive peri-hepatitis and peri-splenitis with a chronic pleuritis and peritonitis and ulcerative enteritis. He thinks his case one of primary tuberculosis of the stomach. Fisher De Foy, in 1906, adds another case; the stomach was bound to the liver in several areas by caseous glands, and the lungs were involved. He considered the stomach to be the primary focus. The analogy between these cases and the one reported, is rather striking, and even though it seems that these cases might be of primary gastric origin, the evidence is quite strong in favor of infection of the stomach from without, as will be shown. Van Wart, in 1903, reported a case where there was a caseous mass 3.5 cm. in diameter lying between the two muscular coats of the stomach and covered by a perfectly intact mucosa. There was no other tuberculosis in the body. He thought this lesion probably primary, but it is difficult to see just how the organisms could enter in such a position without leaving some visible trace. If it was due to ingestion of tuberculous material, one would expect to find some involvement of the lymphatics draining the upper alimentary tract, especially the submaxilliary and the sublingual glands, as Orth found in all the animals fed on tuberculous tissue. In his experiments, he rarely found any gastric lesion; occasionally there was a slight hæmorrhagic erosion, and still more rarely ulcers of tuberculous character. This seems to show that primary tuberculosis of the stomach is possible at least in animals.

Secondary involvement of the stomach is of much more frequent occurrence. Hamilton, in 1897, collected the cases in the literature, and added three cases. In 1898, Blumer was able to collect 30 authentic cases, to which he added one. Glaubitt, in 1901, reported 47 cases. The cases reported since then likewise are few. Ruge, Fisher DeFoy, Curschmann, Van Wart, Alexander, Kansow, Rosset, Cone, Reinhold (and a few others whose work has been inaccessible to me), reporting each one case. The rarity of the lesion is self-evident when we recall that Simmonds only found eight cases of gastric involvement in 2000 autopsies on tuberculous patients.

To what does the stomach owe its immunity? (1) It was thought that the secretions of the stomach had some deleterious effect upon the organism, but it has been shown by Faulk and Frank that organisms suspended in gastric secretion and incubated at 38° for six hours were unaffected and only lost their virulence after 24 hours. (2) Simmonds thinks the essential point is whether the active organism can harm the mucosa which is secreting normally. He reports a case where cancer and tuberculosis existed side by side, and thinks, the carcinoma was primary, that it led to a change in the gastric juice which allowed the tuberculous process to develop. He mentions that there was pyloric stenosis. The motility must have been affected as also the length of time ingested material remained in the stomach. These two latter factors together with the thinned wall of the dilated organ are important factors in the development of the lesion. (3) Dürck and Oberndorf, and Curschmann consider motility as one of the most important protective agencies. (4) Struppler thinks intact epithelium the best protection against ingested tubercle bacilli, but that they may affect the lymph follicles without damaging the epithelium. Later, in the discussion of tuberculous cavities in the liver, we shall have occasion to speak of this again; it is the same question that arises in tuberculosis of every organ. Can any organism (which is not motile) pass through epithelium without leaving any sign? But be that as it may, certainly if there is a lesion, due to a small loss of substance, consequent upon an ecchymosis, as Hamilton suggests, it is easy to conceive of this as a favorable place for any organism to center and develop. (5) It is said that the sparsity and depth of the lymphoid follicles is against the occurrence of tuberculosis of the stomach. Barbacci considers them the primary seat of infection. Przewoski likewise considers them of importance. He describes several cases, complicated by chronic pulmonary phthisis, and thinks the duration of the pulmonary involvement an important factor, since the physiological activity of the stomach is often lessened, and because there may be some predisposing pathological change such as catarrhal inflammation. Whether these changes are sufficient to alter any antiseptic action of the gastric juice seems doubtful, as Marfan and Schwalbe have shown many cases of pulmonary phthisis to be suffering from chronic gastritis without any tuberculous involvement supervening. Dobrowolski has lately shown that the lymph follicles which are not always so rare in the human stomach are markedly increased in catarrhal gastritis, so much so in fact, that he has applied the name "gastritis granulosa" to this change. It is of interest to note here a case recently reported by Cone where

the stomach was the seat of a diffuse chronic gastritis in which there were nodules of several histological types; among these, nodules specifically tuberculous confined to the lymphoid follicles. On the other hand, Wilms thinks the lymph follicles have nothing to do with tuberculosis. He reports a case of numerous tubercles in the sub-mucosa of the stomach of a child nine months old, dead of generalized tuberculosis. He thinks in a child of this age the lymph follieles must be scanty and still in his case there was marked tuberculous change. (6) Przewoski also suggests the nature of the organism may have much to do with the lesion. All these factors taken into consideration seem to be evidence enough for the rare occurrence of infection through the gastric mucosa.

A more common mode of infection is thought by Barbacci to be through the blood or lymph stream. Simmonds says, "Contrary to the formation of ulcers, the finding of miliary tubercles of hæmatogenous origin, is not rare." He has found these in several cases. Wilms and Kaufmann have also recognized this mode of infection and they think tubercles will be found in these cases according to the care with which one looks for them.

The last mode of infection to be considered was first emphasized by the cases of Birch-Hirschfeld and Hattute. In these there was a pre-existing inflammation of the serosa which had spread to the mucosa by direct extension. In many of the other reported cases, there exists a circumscribed, or generalized tuberculosis of the peritoneum, involving the stomach wall; a mass of tuberculous lymph glands, as in Litten's and Hamilton's cases, or an extensive adhesion to a neighboring organ, as in Ruge's, Fisher DeFoy's, Curschmann's and many others, but probably most suggestively illustrated in the case here reported. Surely we must definitely rule out any such cause as this before we grope about among the more obscure possibilities of primary infection through the mucosa.

Classification.

It seems from the foregoing that it is necessary to distinguish several general modes of infection.

I. Those arising from a continuity or contiguity of structure. This is possibly best illustrated by the case here reported. We include in this class cases where there is a tuberculous peritonitis, since the serosa is certainly first affected. This must be the mode of infection, in a vast majority of cases.

II. Hæmatogenous infection as part of a general miliary tuberculosis. This is illustrated by cases of Wilms, Kaufmann, and Simmonds.

III. Those arising from ingestion of tubercle bacilli.

(a) Through a healthy mucosa (that this may occur seems doubtful).

(b) Where there was some factor which predisposed to the infection.

1. Lack of motility and dilatation.
2. Change in the gastric secretion.
3. Slight damage to mucosa as small losses of substance, due to ecchymosis, etc.
4. An increase in lymphoid follicles, as in "gastritis granulosa."

Tuberculous Cavities of the Liver.

Barrier, Rillict and Barthez first described the so-called gall cysts in the liver of tuberculous children; the latter recognizing their tuberculous origin. Cruveilhier, Foster and others have since described them as simple cysts.

Tuberculosis of the liver occurs most commonly in children, but is not infrequent at any age. Simmonds found 86 cases in 160 dying of pulmonary tuberculosis. While there is some general difference of opinion as to the frequency of occurrence, it seems that the liver is found involved more commonly in acute than in chronic cases, because of the tendency of the lesion to heal (Zedden). Baumgarten in a large series of experimental inoculations, found the liver less frequently affected than the lung, kidney and spleen; no matter how old the experiments were, he rarely found nodules larger than the head of a pin, though these may be very numerous. Cases are reported where a caseous mass, the size of a hazel nut occurred, without cavity formation.

There is no universal agreement as to the occurrence of cavities in the liver. Though they may not be infrequent, their size varies markedly. We often find tubercles with a minute green center. Microscopically these are seen to be small cavities containing duct epithelium, and bile salts. On the other hand we rarely encounter a cavity the size of a hazel nut, and as the size of the cavity increases so the frequency of its occurrence decreases. In four recent autopsies, on cases of generalized miliary tuberculosis, I have found in three, minute cavities, while in the fourth there was a cavity $\frac{1}{2}$ cm. in diameter. Often multiple sections must be made before the tubercle with its green pin-head size center is found, but it seems that they will be found directly in proportion to the care with which one looks for them.

The many conceptions concerning the formation of these cavities, may be briefly summarized in two ideas long ago brought forward. Rokitarsky thought they were the result of softening of a conglomerate tubercle, while Virchow believed them widened bile-ducts, which had undergone caseous degeneration. Jacobson has suggested that Rokitansky's theory of hæmatogenous infection, be divided into two subdivisions; (1) portal, and (2) arterial. Klebs thinks that though the infection might be venous in origin, its spread is effected by the lymphatic channels possible by phagocytic cells which after ingesting the organisms degenerate. The real discussion has hinged about the first two theories.

Barthez and Rilliet, in 1894, thought the infection to be primarily one of the bile-ducts. With them Simmonds, Gilbert, Claude, Sergent, etc. have supported the ascending theory, while Birch-Hirschfeld, Fletcher, Kotlar, Zedden and others have supported Rokitansky. Microscopically the evidence is not convincing for either side. Kotlar describes three cases in which there were multiple cavities. Most of these

contained bile, though a few were free of any trace of bile. These latter likewise contained no duct epithelium and were simply an accumulation of tubercles which had softened in the center. In all of the bile-stained cavities duct epithelium was found. In many cases Kotlar was able to trace this epithelium by serial sections, to some bile passage which communicated with the cavity; in no case could it be said that the epithelium was all of one duct, but rather of many small ones which had gradually been involved in the process. He concluded that the infection must be hæmatogenous, affecting the ducts from without-in and the bile-duct epithelium being more resistant to the process of coagulative necrosis, persists longer, and was therefore seen in the cavity.

Fletcher describes a case with many tubercles in the liver, most abundant in the portal areas. Many of these were quite large, surrounded by a fibrous capsule, in many the remains of a bile duct was seen; while in others softening had occurred, and the duct was destroyed. He concluded that the ducts were secondarily invaded from without, and that the infection was brought in by the portal vein.

Simmonds could trace a large cavity into a single bile-duct. He thought the process started in the periduct connective tissue, and spread into the duct, but that the infection was ascending in origin and that the organisms passed through the epithelium.

Sabourin likewise illustrated a direct communication between a large bile-duct and a cavity.

I have been able to trace several small cavities into a single bile-duct. It seems, however, that such findings are only of value when positive for in the further caseation and degeneration of a small cavity, it is quite natural that many more ducts will become involved from without and that the size of the cavity will rapidly become disproportionate to the size of the duct from which it originally started. That even though its epithelium may resist somewhat longer, it must ultimately succumb to the process with the result that a cavity arising from a single duct will no longer have its original epithelium but have a caseous wall in which many bile-ducts empty. As soon as a duct is invaded the outpouring of tuberculous material will cause inflammatory changes, at least, if not true tuberculous change in the communicating ducts. No matter how the process started, as soon as, even a minute cavity is formed, the ducts must necessarily be important disseminators of the process. It seems justifiable therefore to conclude that the microscope is of little or no value in deciding whether a cavity arose in a duct.

The experimental results are more satisfactory. Gilbert and Claude injected tublercle bacilli into the common bile-duct of animals. After two days, they found marked angiocholitis, tubercle bacilli and round cells surrounding the ducts. They could not find any organisms in the epithelial cells. (Zedden argues that it is difficult to understand how a non-motile organism could pass through the epithelium.) The changes progressed slowly and only after three months did they find tubercles. These were scattered through the entire liver tissue, but in much greater abundance in the portal areas. Some of these latter appeared to be softening. They also injected organisms into the hepatic artery but in no case did they find the initial predominating lesion of the ducts above described, and they think we must take note of this in our decision as to whether the infection is ascending. The objection cited in the above paragraph arises here also. In order to determine the primary changes in the ducts, we would have to examine the tissue before cavities had formed, since there is a continuous discharge of tuberculous material into the ducts as soon as a cavity is formed.

Sergent was able to find the organisms in the bile cavities in every case. He says the reason why they are not usually found, is explained by the work of Brissaud and Toupet. They allowed sputum rich in tubercle bacilli, to remain in bile for some hours and then were no longer able to find the bacilli. This is due to an envelope of bile which forms about the organisms and must be removed before they can be stained. He used the method of Lustgarten: treat organisms with equal parts of alcohol and ether and decolorize with potassium permanganate and sulphuric acid. He also found bacilli in the duct epithelium after injecting them in the common bile-duct. After a large series of inoculations, he concludes that there are two types of infection: (1) Non-systematized, affecting the gall-ducts from without-in, as a result of inoculating animals by the portal vein. (2) Systematized, affecting the bile-ducts from within-out, when the organisms are injected into the common bile-duct.

One of the most important points to decide is whether the bile has any deleterious action on the tubercle bacilli. Zedden examined the bile in 20 cases and only found the bacilli in one. Sergent after inoculating the common bile-duct of a dog with tubercle bacilli, removed the bile from the bladder 78 days later and injected it into a guinea pig which died in 40 days with typical lesions. Kockel has shown that on injecting the mesenteric vein of guinea pigs with tubercle bacilli, many were found in the liver, after the first few days. These rapidly disappeared, some engulfed by phagocytes, some after 18 days showing a form of granular degeneration. Maffini and Sirleo likewise found the organisms undergoing granular degeneration after being engulfed by the liver cells. This suggests the possibility that even though bile may be a favorable medium for their development, the liver cells themselves rapidly destroy the organism.

That some such destruction of organisms must take place in the liver, seems perfectly evident. When we consider the great numbers of organisms which are constantly filtered through its capillaries in a general infection and which certainly must lodge there just as pigments, powdered cinnabar, for instance, and compare this with the rare occurrence of any extensive tuberculous disease, or in fact any infectious process, there remains a great disparity which can only be explained by the death of the organisms in the liver. On the other hand, parasitic diseases of the liver are more common; although amœbic dysentery is much rarer than the ordinary bacillary forms, abscesses of the liver are by far more frequent in the former disease.

Dürck and Oberndorf suggest several possible reasons for the relative immunity of the liver to tuberculosis. (1) Anti-bacterial action of the bile. (2) Phagocytosis. (3) Alexin theory, that the tissue juices of the liver have a specific anti-bacterial action. Starker tried media made of liver tissue, but could find no difference in the growth of tubercle bacilli on it, and on ordinary media. His method, however, was so crude that if there was any anti-bacterial action of the liver originally, it would have been destroyed.

The case here reported is of particular interest in this respect, for on the one hand we have the stomach and liver the seat of marked tuberculous change while on the other hand such organs as the lungs and intestines are practically unaffected. It is well known that experimental inoculations of tubercle bacilli, no matter where they are introduced, most often multiply in the lungs, spleen and kidneys, and cause extensive change; that tuberculosis of the pancreas is a very rare occurrence; that tubercles in the liver are almost always minute and tend to heal rapidly and possibly most striking of all a normal testicle is often found side by side with a caseous epididymis. These are only a few of the pathological anatomical facts which seem to point toward a possible answer to the tuberculosis problem.

The question is not why we have tuberculous cavities in the liver, but why we do not have them in every general tuberculous infection, why the pancreas is never affected and why the testicle escapes, etc. There is only one possible answer. The organisms certainly reach these tissues, but they are unable to develop in them. There must be therefore, some property in common to them, which directly or indirectly destroys the baccillus. If Starker found that tubercle bacilli grew as well in media of liver tissue as on ordinary media, it is probable that his liver media was at fault, or that he destroyed the property he was looking for. A more satisfactory way would be to remove aseptically tissue from various animals and try the growth of the organisms on them without further sterilization.

Summary.

Tuberculosis of the stomach may arise in the following ways:

I. By continuity or contiguity of structure. This is probably the most frequent mode of entrance.

II. Hæmatogenous infection as part of a general miliary tuberculosis.

III. By ingestion of tubercle bacilli.

(a) Through a healthy mucosa.

(b) Where there is some predisposing change in the mucosa.

Tuberculous cavities in the liver will be found directly in proportion to the care with which one looks for them. They are of two general types.

I. Entirely independent of the bile passages and containing neither bile nor bile-duct epithelium.

II. Those containing bile and bile-duct epithelium.

(a) Those arising from an ascending infection of the bile passages.

(b) Those arising from secondary involvement of a bile-duct in a caseous mass.

It is impossible to distinguish these two types microscopically for as soon as a cavity is formed, the bile-ducts will be a factor in the spread of the lesion. It will also be impossible to say whether a cavity has formed from a single bile-duct, for the epithelium will disappear after the cavity has attained any considerable size and its branches will empty into the cavity.

Bile has no deleterious effect upon tubercle bacilli. Tubercle bacilli rapidly undergo degeneration in the liver. This may be due to some natural immunity which the liver shares with other organs rarely affected by tuberculosis as the pancreas, thyroid, testicle, etc.

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A CASE OF SIGMOID KIDNEY.

By M. C. Winternitz, M. D.,
Fellow in Pathology, The Johns Hopkins University.
(*From the Pathological Laboratory.*)

This ease is of particular interest beeause of the unique shape of the kidney. Morris pictures a case deseribed by Coupland of the same general type of fusion, but where the right kidney, which is the lower, is much smaller than the left; and where the shape of the mass is rather oval than sigmoid. Broesike described a fused kidney very similar to the one found in this case. He was the first one to suggest the name "ren sigmoideum" or "sigmoid kidney" for this type, on aeeount of its resemblance to the Roman letter "S." His kidney, however, does not conform nearly so well to the letter "S" as the one here reported:

N. J., age five months, autopsy No. 2952.

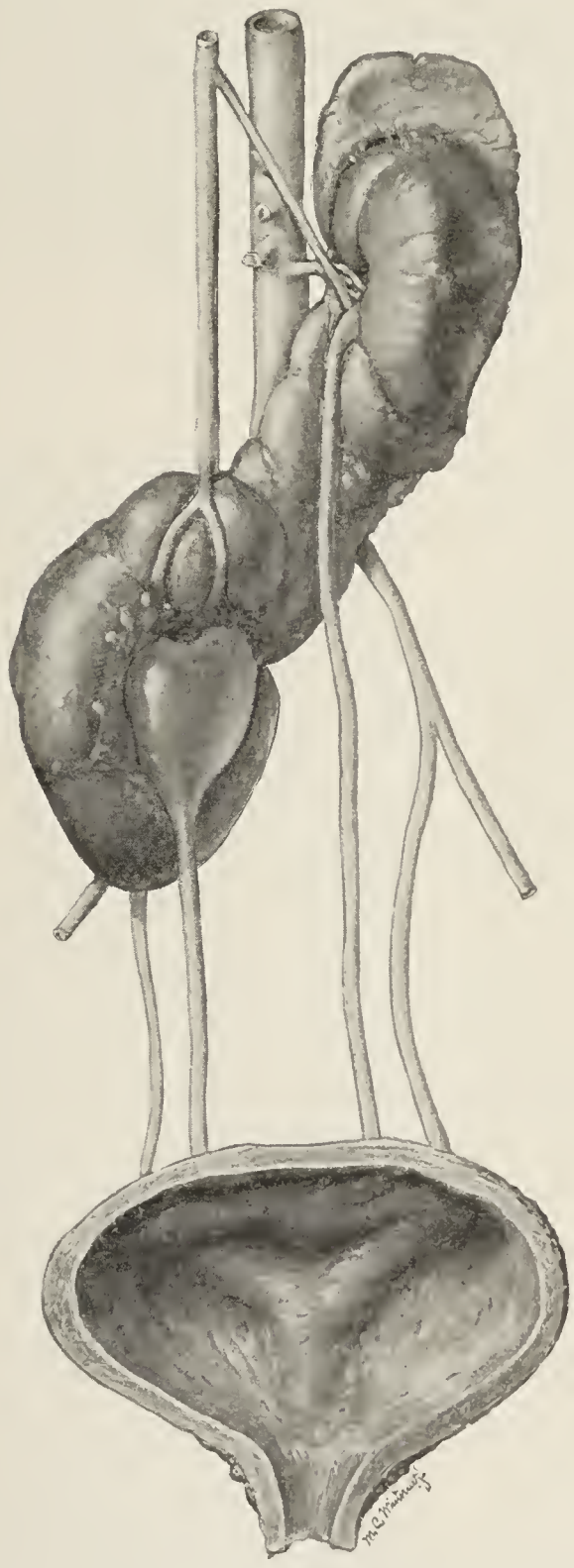
Anatomical Diagnosis.—Acute and chronic ulcerative enteritis and colitis; hyperplasia of the lymphoid follicles of the intestine; emaciation; sigmoid kidney.

After the removal of the intestines, a mass was found lying on the spinal column at the level of the fourth and fifth lumbar vertebra, covering and extending below the bifurcation of the aorta. On examination this was seen to lie sub-peritoneally and to be continuous with the left kidney. The right lumbar fossa, where the right kidney should have been, was hollow and, contrary to what might have been expected, contained no fat. The left kidney seemed to be in its normal position, the upper pole reaching to the level of the eleventh rib. The aorta, vena cava, and retroperitoneal tissue were divided at the diaphragm and carefully removed with the kidneys and pelvic organs.

The two kidneys were then found to have fused, and formed a large "S"-shaped mass, measuring about 8½ cm. in length. It was composed of two distinctly kidney-shaped poles; the upper measuring 4 x 2 x 2 cm. the lower 4½ x 2½ x 2 cm. These were connected by a flattened cylindrical mass of renal tissue, 2 x 2 x ½ cm. in dimensions. Each pole had a definite hilum, the superior facing the mid-line; the inferior, while nearer the mid-line, was directed anteriorly. The ureter of the superior pole, as it entered the hilum, appeared normal; while the calyx of the uterer of the lower mass was bulged out and dilated into a heart-shaped structure, about 1 cm. in diameter. Both ureters entered the bladder in the normal position. The blood-supply, as might have been expected, was anomalous. There were two renal arteries and two veins. The superior artery arose from the aorta at the usual level, and passed directly across to the upper hilum. About 1 cm. before entering the kidney, it divided into two branches: an upper one going to the left adrenal, and a lower larger one which immediately divided again, its upper branch winding around the vein to enter the hilum in front of it, while the lower branch entered behind the lower branch of the vein. Therefore, at the upper position the order from front to back was ureter, artery, vein; while below it was vein, artery, ureter. The two branches of the vein joined a third from the adrenal and emptied into the vena cava (this was collapsed, due to manipulation of removal) somewhat higher than usual. The second artery arose from the ventral side of the aorta about ½ cm. above its bifurcation, and passing in a groove between the connecting cylindrical portion and the lower mass, divided into many branches which entered the renal substance. The last of these wound around to the mid-line and entered the hilum just posterior to the ureter. The two veins, arising anterior to the ureter, soon joined the vena cava. Here the order from front to back was vein, ureter, artery. (There was a small opening on the posterior surface of the cylindrical mass, but what this was could not be determined.)

The left adrenal was in its normal position, but the right, though carefully searched for, could not be found.

McMurrich, in a report of a case of crossed dystopia of the kidney with fusion, collects the cases up to that time, 28 in all. In 15 of these the fused mass was to the right of the ver-



tebral column. In two the mass was crescentic, with the lower pole lying in front of the spine. Usually the hila are both anterior; occasionally, however, one hilum may be in its normal position, while the other, usually that of the crossed kidney, is on the anterior surface.

According to Pohlman the anomalous form of the kidneys may be explained as follows: as a result of some unknown cause, the right renal bud has developed more slowly than the left. He thinks this might be due either to a slower growth of the right bud or to a later date of its appearance, and describes such a retardation of development in embryo, Mall 114 (10 mm. long). As a consequence, in the case reported, the left kidney had reached its normal position and almost entirely rotated, while the right was somewhat lower and had not rotated. In this position the two renal buds had come in contact and fused, the upper pole of the right uniting with the lower pole of the left. As a consequence further rotation or ascent became impossible. We must also consider the possibility that the position of the right kidney might be due to its premature vascularization and consequent anchoring. It has been shown by Hill that the vascularization is entirely dependent on the position of the kidney. Thus a bud which has been slow of ascent might receive its artery from a lower point on the aorta than normal, and by this means be held in a lower position. The occurrence of cases of misplaced kidneys without fusion (Howden, Farquhorsen, etc.) seems to strengthen this possibility.

In the majority of cases of fusion or misplacement of the kidney thus far reported, the adrenal has occupied its normal position. In some cases it has been somewhat misshapen and in others misplaced. Bunner reported only five instances of absence of the adrenal in 48 cases of solitary kidney. In McMurrich's 28 cases, where there is a note concerning the adrenal, it was present in all but one.

Anomalies of the genital tract are much more common accompanying these conditions, but in this case the reproductive organs were quite normal.

In closing, I wish to thank Mr. M. Broedel for his kind assistance and direction in making the accompanying drawing.

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THE RELATION OF BRONCHIAL STENOSIS TO BRONCHIECTASIS.

By W. L. Thornton and J. P. Pratt.

(From the Hunterian Laboratory of Pathological Physiology, Johns Hopkins University.)

Inflammatory changes in the bronchial walls and stenosis of the bronchi are generally considered the chief etiological factors of bronchiectasis. At the suggestion of Dr. MacCallum an effort was made to determine the changes resulting from a bronchial stenosis.

In order that the changes of the lungs during respiration might be observed an artificial thorax was constructed (Fig. 1). This artificial thorax consisted of a glass cylinder one end of which was covered by a rubber diaphragm, the other being provided with a tightly fitting glass cover. A rubber stopper with four holes was fitted into the cover. The lungs and trachea, removed from a dog, were suspended within the cylinder by fastening the trachea to a tube passing through one of the holes in the rubber stopper. This tube also served to put the trachea in communication with the outside atmosphere. A canula was inserted into each bronchus, the canulæ being connected to tambours by tubes passing through the rubber stopper. The fourth hole of the stopper was filled with a tube provided with a clamp. By means of this tube a negative pressure could be established in the artificial thorax.

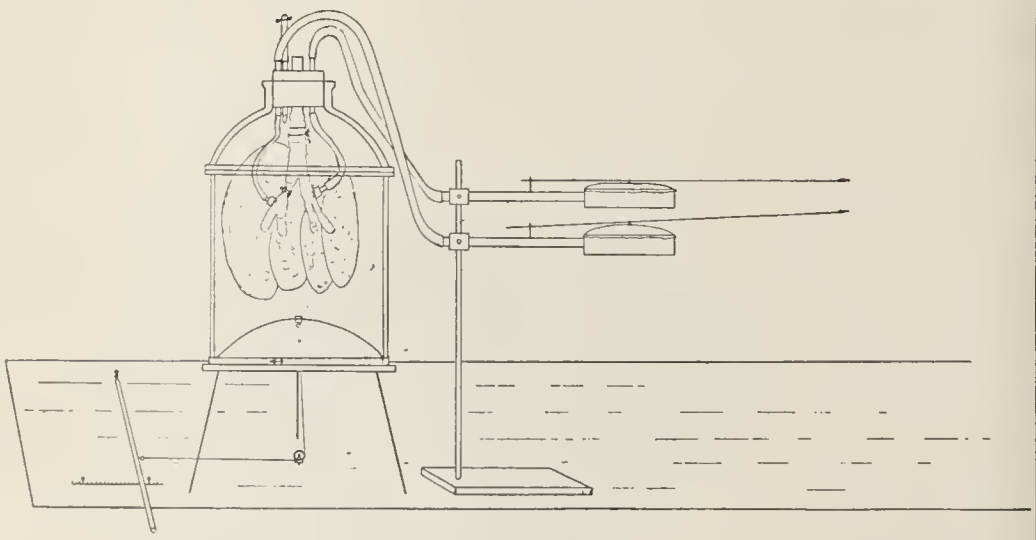


Fig. 1.

Having the apparatus arranged as described above, respiratory movements were simulated by successively pulling down on the rubber diaphragm and then allowing it to return to its original position. The movements of the diaphragm were made by means of a cord which was attached to the center of the diaphragm and passed over a pulley to a lever. The extent of the movements was controlled by moving the lever along a graduated scale.

The bronchial stenosis was produced either by a screw clamp around the bronchus or by placing short pieces of tubes with different-sized lumens inside of the bronchus. Simultaneous records were obtained from the two bronchi, the writing levers of the tambours being superimposed.

When there was no occlusion of either bronchus, the record given by the tambours showed only a slight negative pressure with inspiration and a slight positive pressure with expiration. But when one bronchus was partially occluded the pressure changes in the lung behind the occlusion were more marked; the greater the occlusion the greater the negative

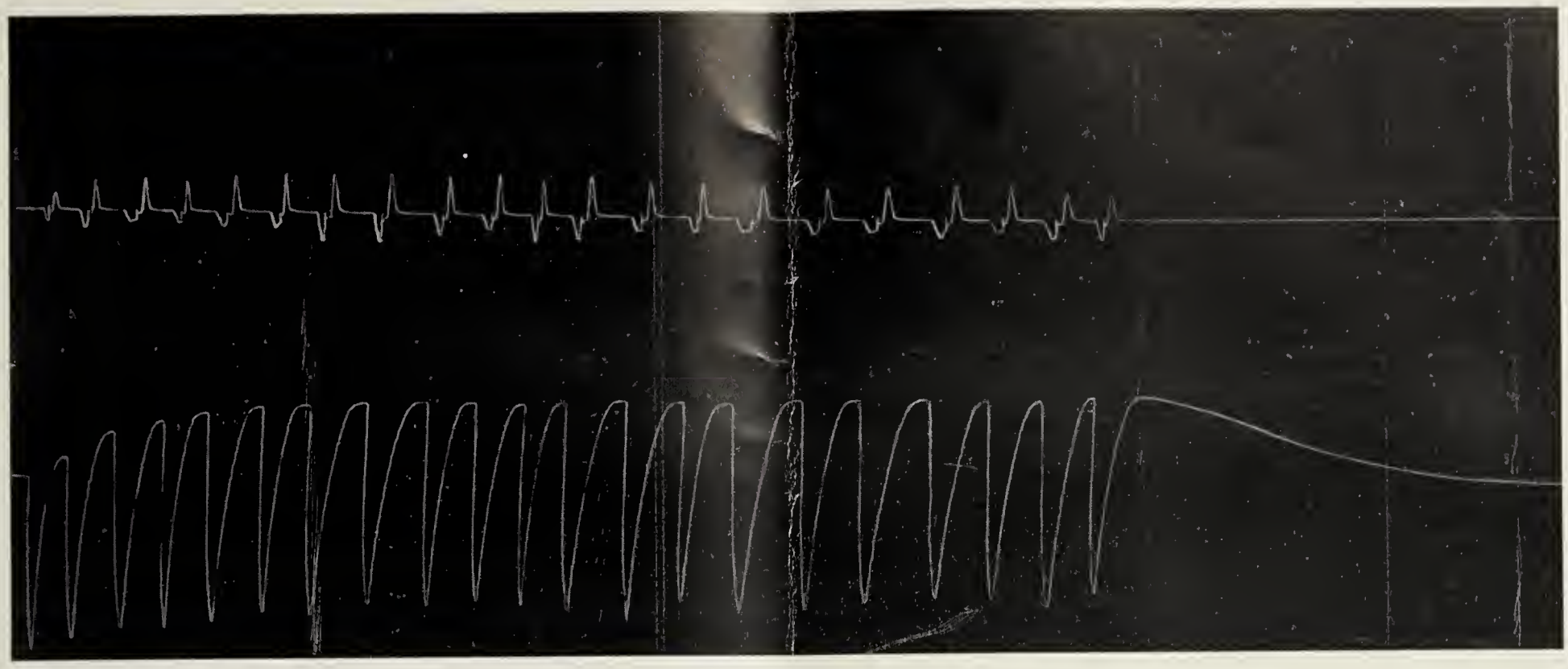


FIG. 2.

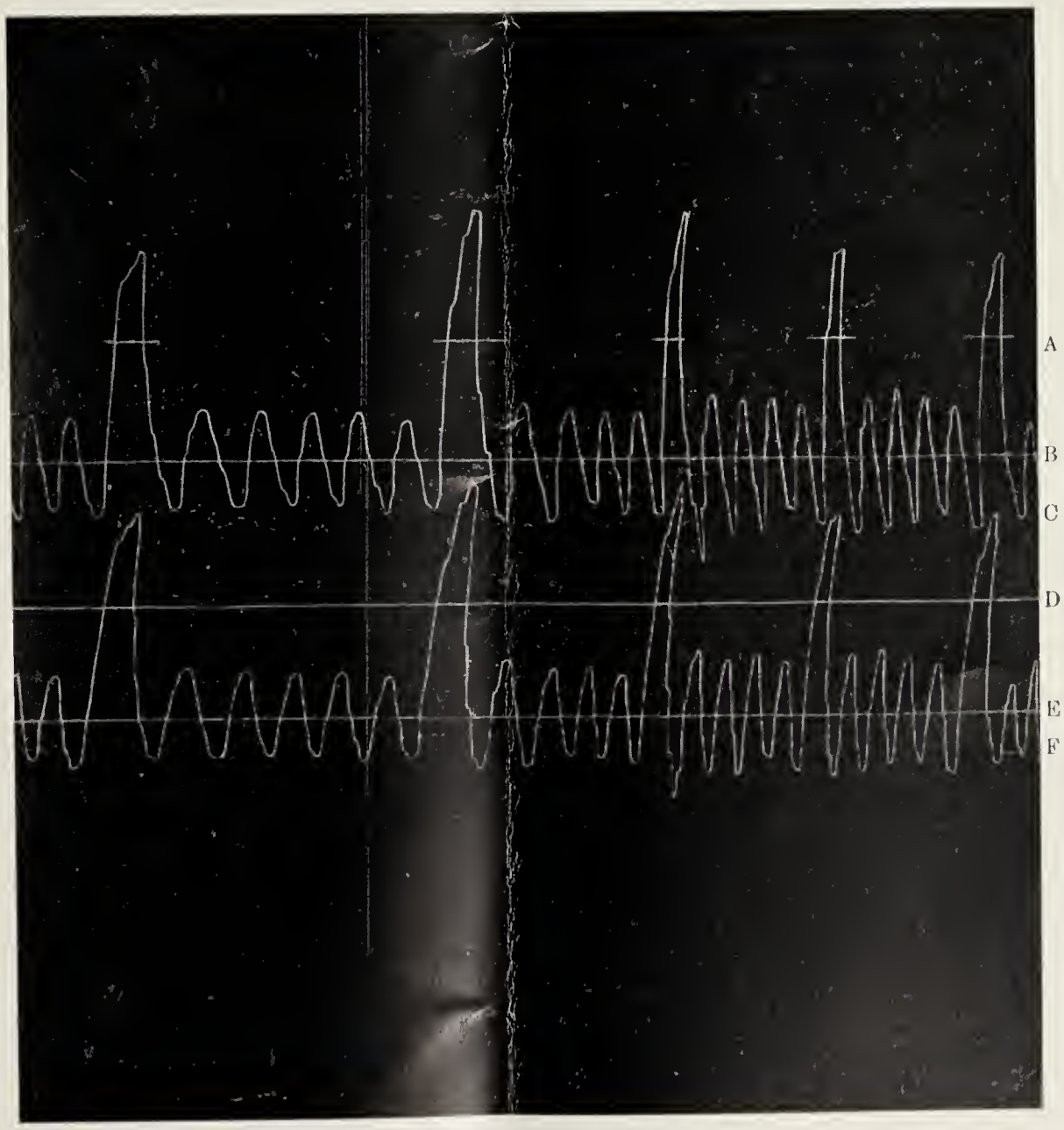


FIG. 4.

pressure on inspiration and the greater the positive pressure on expiration. In addition inspiration and expiration are so protracted that the opportunity for a pause no longer exists and they occupy the whole cycle. When the lumen of a bronchus was reduced, the lung corresponding to the bronchus involved, during expiration failed to contract as completely as the lung with an unobstructed bronchus. Owing to this failure to completely contract, an excess of air remained in the lung and the lung remained continually distended, as is shown by the record taken by the tambours (Fig. 2).

The continued distension of the lung may be explained by reference to the diagram in Fig. 3. *a* represents the position of the lung at rest, *b, c, d, e,* and *f* different positions of the lung during inspiration and expiration. When there is no occlusion of the bronchus there will be only a very slight resistance to the ingress or the egress of air. At the end of inspiration the lung will come to the position *f,* then during the expiratory period the elastic recoil of the lung will bring it back to the position *a.* It is evident that the

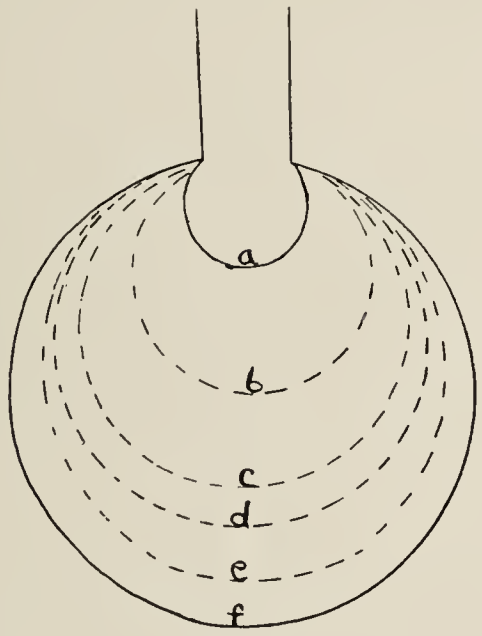


Fig. 3.

force of the elastic recoil will be greater at *f* than at *e,* greater at *e* than at *d,* greater at *d* than at *c; i. e.,* the more the lung is distended the greater will be the force of the elastic recoil, and the more the lung is collapsed the less will be this force. Now if the bronchus be partially occluded the resistance to the passage of air will be increased, and during the first inspiration the lung will be distended only to *c.* The elastic recoil at *c* is not sufficient to bring the lung back to *a* before the next inspiration begins, so the second inspiration begins with the lung at *b* and distends it to *d.* During the following expiratory period the lung recoils to *c,* and so on till a balance is reached between the forces of expiration and inspiration, so that with each inspiration the lung will distend to some point *e* and with expiration will return to some point *d.* Thus it will be seen that the lung continually approximates the inspiratory position.

The relative positions of *d* and *e* will vary with (1) the resistance to the passage of air, *i. e.,* the amount of the occlusion of the bronchus, (2) the time of inspiration and expiration, (3) the elasticity of the lung.

(1) As the bronchus is narrowed *d* will approach *e* till finally, when the occlusion is complete, *d* and *e* will nearly coincide. As the occlusion is removed *d* and *e* will recede till *d* reaches *a* and *e* reaches *f.*

(2) If the inspiratory time be increased *d* and *e* will both approach *f.* If the inspiratory time be decreased *d* and *e* will approach *a.* If the expiratory time be increased *d* and *e* will recede and both will approach *a.* If the expiratory time be decreased *d* will approach *e* and both will approach *f.* If both inspiratory and expiratory time be increased *d* and *e* will recede from one another. If both be decreased *d* and *e* will approach each other.

(3) Although no attempts were made to alter the elasticity of the lungs, it is evident, since expiration depends upon the elastic recoil of the lung, that any interference with the elasticity of the lung would alter expiration; and it would seem that if the walls were weakened the distension would be very much greater than in a normal lung.

In Fig. 2 the upper curve was taken from a tambour connected with an unoccluded bronchus, and the lower curve from a tambour connected with a bronchus that was partially occluded. In the upper curve the expiratory pressure balances the inspiratory pressure with the first respiration and when the respiratory movements stop the curve comes at once to zero or atmospheric pressure. In the lower curve the negative pressure of the first inspiration is as great as or greater than any of the succeeding inspirations, but the positive pressure of the first expiration is small and it gradually increases with the succeeding respirations till it balances the negative pressure of inspiration. When the respiratory movements cease the curve does not immediately come to zero, but falls gradually, showing that air has been entrapped and slowly leaks out.

What has been represented here as taking place in a few respirations must appear very gradually as a result of bronchial stenosis due to the pressure of a tumor or swollen gland, or some similar cause. If a foreign body lodged in a bronchus the above changes might follow very rapidly.

Much stress has been laid upon the increase in intrapulmonic pressure produced by coughing and by such occupations as glass-blowing and playing of wind instruments, in all of which there is a forced effort at expiration against a closed glottis or against an obstruction. A manometer connected with a bronchus would show a great rise in pressure during coughing, just as the manometer connected with an occluded bronchus shows in the model a great elevation of pressure when coughing is imitated. In Fig. 4 such an experiment is carried out with the instrument described above and the upper curve *C* shows the pressure in the occluded bronchus while *B* is the line of atmospheric pressure. In the lower curve, which represents intrapleural pressure, *D* is the line of atmospheric pressure, *E* the line of lowered pressure when the air is sucked out to produce the conditions under which the curve is traced, *F* is the curve made by the same imitations of cough as in the upper tracing. Above, *A* is drawn at a distance from *B* which exactly represents the negative pressure which exists

in the pleural cavity. Now a sudden pressure on the elastic diaphragm of the model with simultaneous occlusion of the bronchus or trachea will represent a cough, and several instances are shown in the curve. It is seen that the pressure in both bronchus and pleura rises greatly and that in form the curves are identical. Curve *F*, however, starts from a negative pressure which really represents the tension necessary to overcome the elasticity of the lung and maintain it at the degree of distension existing during the experiment. Curve *C* starts from atmospheric pressure. The excursion due to cough measures the same and therefore the pressure in one of these attacks of cough is greater within the bronchus than within the pleura by the elastic recoil of the lung. Of course, the relation between the pressure due to the elastic recoil and that due to increased thoracic pressure is very much exaggerated in experiments with this small apparatus.

From these considerations it is evident that in any such act the pressure within the bronchi is greater than that without only by the effect of the elastic contraction of the lung. Otherwise all that portion of the bronchus which is within the pleural cavity and exposed thus to the pressure of the thorax is supported on all sides by the lung tissue, which is subject to the same pressure, and there can be no tendency for it to dilate. On the contrary those parts of the bronchus and the trachea which are outside the support of these compressed tissues are exposed to a distending internal pressure which may be rather high. It is true, however, that during cough the tension under which the air exists in the lung and bronchi is greatly increased, and the same thing occurs in glass-blowing and the playing of wind instruments. This probably could result in a squeezing out of the blood that to some degree might interfere with the nutrition of the pulmonary tissues and may play possibly a part in the genesis of emphysema or even bronchiectasis. This is true in cough only during the actual preparation for the explosive outburst of air from the lungs, and in glass-blowing, etc., only during the actual effort at blowing which follows the deep inspiration. It is therefore of so intermittent a character that its effect in producing malnutrition of the tissue seems doubtful. In the case of a partial obstruction of the bronchus, on the other hand, where the hypertension in the alveoli as compared with that in the normal alveoli is associated with a constant passive overdistension with an excessive amount of air, the conditions to which the bronchial and alveolar walls are exposed are much more serious and really likely to produce damage. It is on this account that we think that such partial obstruction and consequent passive overdistension is probably a fundamental factor in the production of bronchiectasis and emphysema, and its importance is enormously increased when there is associated with it an inflammatory process which may weaken the bronchial wall.

Summary.

The partial occlusion of a bronchus causes air to be entrapped and the bronchus distended, with greater changes in pressure behind the obstruction during respiration. In coughing and related processes the pressure inside the bronchus is greater than the pressure outside the bronchus only by the force of the elastic recoil of the lung; so there is no marked tendency on the part of the bronchi to undergo dilatation.

ON THE OCCURRENCE OF NEWLY-FORMED LYMPHATIC VESSELS IN MALIGNANT GROWTHS.

WITH A DEMONSTRATION OF THEIR ORIGIN AND INGROWTH IN THE METASTASES OF A ROUND-CELLED SARCOMA.

By H. M. Evans, M. D.

(*From the Pathological Laboratory of the Johns Hopkins University.*)

A search of the current literature, both in medical journals and that in the more important works on the subject,[1] has not revealed the report of any instance in which proper lymphatic vessels were found growing in malignant tissue. The present case, then, is of peculiar interest in this respect; nor does our knowledge of the genesis and behavior of the lymphatic system in general, in spite of recent researches, forbid as superfluous the record of an instance in which both the origin and ingrowth of these vessels seem especially clear.

Practically as old as the recognition of new growths themselves is the knowledge that they possess a blood supply, often, indeed, especially rich. And, though a matter of some doubt until recently, it would appear that nerves are distributed in such tissues.

Borst,[2] in referring to lymph vessels in tumors, recognizes that almost nothing is known about them and consequently hardly discusses the subject. He mentions however that von Heukelom trys to explain the degeneration of many tumors as due to the lack of these drainage channels—an opinion

[1] Such as Borst, Ribbert, Ziegler, Lubarsch-Ostertag, Thoma, etc.

[2] Borst says that according to Ziegler, though lymph vessels had not been proven to exist in sarcomata, irregular spaces and canals in many such tumors must be considered as lymph channels. Such an instance he gives in his Tafel XV, Fig. 83, Bd. I, "Die Lehre v. d. Geschwülsten," Wiesbaden, 1902. The interpretation, of course, is admittedly questionable.

obviously of little value when unsupported by facts. That lymphatics are lacking in such growths is itself an hypothesis even though their presence has never been proven. Those familiar with the delicacy of these structures and with the impossibility of their certain recognition without special methods of study, among which some sort of artificial injection is of prime importance, will not regard the lack of any reports of their occurrence as significant unless these means of investigation have been employed. For though perhaps no general deduction had better be drawn from a single case, it is not impossible, now, that many sarcomata and carcinomata would be found rich in lymphatics were injections of these vessels in fresh tissue repeatedly attempted.

The important researches of MacCallum, Sabin, and Lewis, among others, have solved the riddle of the origin of the lymphatic system, and have shown its later morphological independence as a distinct system of endothelial-walled vessels, not related either to the serous cavities or to the connective tissue spaces with which it has so long been confused, for the lymphatics grow by budding at the tips of their capillaries.

That the lymphatic system possesses some power of regeneration or rather new growth in the adult body has been shown by the work of Coffin, who, at MacCallum's direction, tested this question by producing granulation tissue on the bowel wall in a dog and afterwards injected the lymphatics of this region to find them clearly leading into the young scar tissue.

The present case relates to a patient, F. B., 30 years of age, admitted to the surgical service of the Johns Hopkins Hospital, Sept. 28, 1907, suffering from a marked swelling of the neck of some fourteen months' duration. He died and came to autopsy Nov. 26, 1907. Neither the detailed clinical history[3] nor the entire autopsy report[4] will be given here, but suffice it to say that the case was clearly one of round-celled sarcoma —in the words of the autopsy protocol, "large round-celled sarcoma probably arising in the cervical lymph glands of the left side with involvement of the cervical, inguinal, mediastinal, mesentric, axillary, epitrochlear lymph glands and the following organs: liver, spleen, kidneys, adrenals, peritoneal surface of bladder and the mucosa of the stomach and intestine."

The patient had but a few hours before the necropsy partaken of his usual morning meal and, on abdominal section,

[3] I am indebted to Professor Halsted for permission to add here a few notes from the clinical history of the case. The patient had first noticed a swelling below his left ear at the angle of the jaw about fourteen months previously. The swelling was entirely painless. Within the last six or seven weeks, this had grown rapidly in size and had formed a collar about the neck. For the last six weeks he stated he had suffered from repeated night sweats, and had lost weight. The examination on admission showed a remarkable collar-like mass, "extending from the parotid and posterior auricular region on one side to the same region on the other side along and under the inferior maxillary bone. The mass, which on palpation is made up of a chain of enlarged but discrete non-adherent glands of varying size, starts at the parotid and posterior auricular region of the left side and from here may be traced downwards along the outer side of the left inferior maxillary bone and then over to the right side under the chin stretching inwards as far as the hyoid, and then upwards, running into a large prominent mass in the posterior auricular and parotid region of the right side. Over the mass there is no redness, tenderness, nor sign of inflammation. The mass is composed of glands varying from pea-size to others four or five centimeters in diameter, all discrete, non-fluctuating bodies. The smaller glands are hard, the larger ones somewhat elastic and softened." There seemed to be a deep attachment under the chin, though the masses were generally freely movable. There was also a tonsilar and general glandular enlargement (epitrochlears, inguinals, femorals, axillary, etc.). Up to the last two weeks of his stay in the hospital, the patient was able to be up and about the ward although complaining of weakness and of some œdema of the legs every evening. Towards November 1, the patient complained somewhat of abdominal pain especially along the costal margin. Examination from time to time revealed the presence of palpable nodular tumors which were quite freely movable and interpreted as enlarged mesenteric glands. For the last two weeks he was unable to get out of bed from weakness and died rather suddenly an hour or so after breakfast on the morning of November 26.

[4] I wish to thank Dr. M. C. Winternitz, who kindly gave me the tissue here described, and from whose report I briefly quote. The nodular metastases in the various viscera mentioned are described: "Large masses of glands were found in the supraclavicular fossæ and extending up along the border of the sternomastoid muscles. These joined a collar which formed about the neck below the lower jaw. . . . . The anterior mediastinal glands were likewise much enlarged. . . . . The root of the mesentery is occupied by one large mass of enlarged lymph glands. These vary in size from small ones, the size of a pea, to large ones measuring about 5½ x 3½ x 4 cm. Intestine.—The mucosa, beginning at the duodenum, is markedly thickened, the villi standing out prominently even in the ileum. These are definitely firm and resistant. In places, they form small tumor masses. These vary in size from ½ to 2 cm. in diameter. The larger ones show a distinct hæmorrhagic center, while still larger ones show marked ulceration, leaving a dirty ragged base. In other places, they stand out as large, button-like masses. The colon shows a few of these small tumors.

"Microscopical Notes.—Lymph glands. Nothing remains of the original structure except a few bands of fibrous tissue running in from the capsule. The gland is transformed into a homogeneous mass of cells, between which bands of connective tissue containing blood-vessels can be made out. These, however, are not arranged in any definite system. The cells composing this tumor mass are large, either round or oval in form, the nuclei composing about three-fourths of the cell. These nuclei stain palely with hæmatoxylin, have a definite nuclear network in which masses of deeply-staining chromatin are scattered irregularly. The nuclear membrane is definitely made out. The cell protoplasm is small in amount, stains faintly with eosin, and is finely granular. All stages of mitosis are seen in these cells. Occasionally a nucleus is seen which stains deeply with hæmatoxylin and shows no structure. Other cells are seen which contain several nuclei. They are of many sizes and in places, they seem to be grouped around blood-vessels in concentric rings. Intestine.—The mucosa of the intestine is converted into a large tumor mass in places. This as a rule is made up of well-preserved cells covered on its surface by a layer of necrotic tissue. This tumor mass here is confined entirely to the mucosa. It does not seem to invade the submucosa at all. The masses are of varying sizes, in some places showing only as large papilla-like folds projecting into the lumen of the bowel. Sections taken from the duodenum show the villi to be thickened particularly on their mucous surfaces."

on both the intestine and its mesentery was seen an exceedingly clear and beautiful picture of chyle-filled lacteals. The case afforded so excellent an opportunity for a lymphatic injection of the normal human intestine, it was thought, that pieces of the upper jejunum were taken for injection and study. These coils were distended with warm water, tied off, and their mesenteric vessels ligated. By carefnl sub-serous punctures with a No. 28 hypodermic needle, using India ink as the injecting medium, the larger, superficial, and much-distended lacteals were quickly filled, even against their valves —a procedure which in most instances would have been difficult in the case of the human bowel. The injection stream could also be seen at many places sinking by way of the communicating channels into the intermuscular and deeper levels. Dehydration, clearing, and further study of the intestinal wall showed that in several places the large submucosal lymphatics were filled and in addition even those of the subjacent mucosa. The study of the lymphatic injection in this last coma cells which have extended there in the course of the peripheral growth of the nodule. In these boundary villi between the normal mucosa and the tumor there were observed to arise short finely-tipped outgrowths of the central villus lacteals. At the very edge of the sarcoma these outgrowths were much longer, but still referable to villus lacteals, while in the center of the nodule the new-formed lymphatic sprouts were in such abundance as to obscure the relatively few original mucosal lacteals from which they took origin.

The serial sections, stained after the usual methods, show everywhere that the injection mass was confined in definite channels lined by endothelial cells. Figure 2 shows the tip of one of these lymphatic sprouts cut in a fortunate plane, whereby one observes the prolifcrating endothelial cells of the advancing vessel. These appearances correspond in all respects with what has previously been observed in growing lymphatic vessels.

Fig. 1.

Fig. 2.

tunic showed that one of those areas in which the mucosal lacteals were filled contained several of the many sarcomatous nodules which were fonnd here. Closer study immediately disclosed a delicate system of lymphatic vessels in the little tumor masses, one of which was embedded in paraffine and cut into serial sections five microns thick, while another was halved and mounted in damar to be viewed with the binocular microscope. Figure 1 is drawn from the latter specimen, while Figure 2 is from one of the sections.

The delicate lymphatic channels of the sarcoma nodule are easily seen to be in direct connection with the pre-existent and neighboring lymphatic plexus of the mucosa, a simple meshwork of anastomosing lymph capillaries resting on the muscularis mucosæ. The serial sections entirely confirm this fact. The new lymphatics have arisen from the mucosal system of vessels and study of the periphery of the tumor mass shows well the method and various steps in this outgrowth. It should be mentioned that the villi adjoining these nodules are enlarged and bulbous, made so, as the sections prove, by sar-

It is perhaps important to note that it is the lymphatic capillaries, *i. e.*, merely endothelial-walled vessels without valves and the finest vessels of the lymphatic system here, which have shown this power of growth. And it is entirely probable that in every instance regenerative or proliferative power in the case of the blood- and lymph-vascular systems is manifested primarily by their capillary bed.

The sarcoma nodules in question, then, appear to furnish the first certain instance of a lymphatic vascular supply to malignant tissue, a discovery which might better have been expected, perhaps, in other and larger tumors, but which is especially easy to confirm in lymphatic-rich territories. Whether, in the further growth of these metastases, the lymphatic vessels would have continued their growth, it is impossible to answer with the material at our disposal, but the original stimulus, doubtless chemical, could hardly have been lessened in such a case.

In conclusion, I wish to express my thanks to Professor W. G. MacCallum and to Professor Mall.

A PRELIMINARY REPORT UPON THE EFFECTS OF FEEDING ANIMALS UPON AN IODINE-FREE DIET.[1]

By A. R. Dochez, M. D.

(From the Hunterian Laboratory, Johns Hopkins University.)

The object of the present investigation has been to produce, by experimental methods, some definite change in the histological structure of the thyroid gland in animals. In view of the fact that the thyroids of many dogs, as they are received in the laboratory, exhibit histologically a picture very suggestive of glandular hypertrophy, and resembling that seen in exophthalmic goitre in man, an attempt was at first made to induce this change experimentally.

That such a change could be produced by excising considerable portions of the gland has been known for some time. The object of the present study was not, however, to bring about a compensatory hypertrophy, but to attain the same result by causing slight injury to the thyroid tissue, and in that way possibly to stimulate the cells to increased growth and activity. Small amounts of silver nitrate were used to produce the injury. One lobe of the thyroid was carefully dissected out and a small piece of the gland (too small to cause any compensatory hypertrophy) was excised to be used as a control in noting any change that might take place. The superior thyroid artery was then exposed and a weak solution of silver nitrate injected directly into the blood supply of the gland, through a small branch of the artery. The amount of silver nitrate injected was 1 cc. and the strength of the solution varied from 0.2 to 0.8 per cent. The results obtained, as far as accomplishing the object of the experiments is concerned, were negative in all the dogs treated. About one-half of the animals died of broncho-pneumonia within three weeks after the operations. The thyroids, upon microscopic examination, all showed evidences of injury. Many of the alveolar cells were desquamated and necrotic, and there was a marked increase in the amount of connective tissue varying in amount with the strength of the solution used. Three of the dogs lived four months. The thyroids of two of these animals showed a moderate degree of sclerosis, and that of the third had entirely disappeared, and in its place was found nothing but a ribbon-like band of connective tissue.

When it was found that the above methods did not offer a very hopeful means of solving the problem, Doctor MacCallum suggested that, in view of the apparently important relations of iodine to thyroid activity, it would be interesting to attempt to deprive animals of their natural supply of iodine. On account of the difficulty of contriving an artificial food which should contain the necessary proportions of salts, it was considered best to find, if possible, a natural food which contained either very little or no iodine. A number of food-stuffs were examined, and their iodine content determined by the method of Gautier and Bourcet. The following table shows the results obtained from this analysis:

Food.	Amount.		Iodine Content.
Neuchâtel cheese	100 gm.	(dry wt.)	0.05 mg.
Cow's milk	900 "	"	0.04 "
Cane sugar	105 "	"	0.38 "
Crystallized sugar	60 "	"	0.015 "
Crystallized sugar	65 "	"	0.076 "
C. P. Glucose	50 "	"	0.05 "
C. P. Lactose	50 "	"	0.00 "
Egg albumen	35 "	"	0.00 "
Egg yolk	115 "	"	0.15 "
Chocolate (unsweetened)	60 "	"	0.00 "
Hog brain	58 "	"	Trace.
Hog brain	75 "	"	0.015 "
Hog brain	55 "	"	0.01 "
Almonds	60 "	"	0.00 "
Pig embryos (with thyroids)	75 "	"	0.019 "
Pig embryos (with thyroids)	75 "	"	0.045 "
Thyroids of 4 pig embryos			0.02 "
Thyroids of 4 pig embryos			0.038 "
Pig embryos (thyroids excised)	365 gm.	(wet wt.)	0.00 "
Thyroids of above			0.02 "
Pig embryos (thyroids excised)	530 gm.	(wet wt.)	0.00 "
Thyroids of above			Trace.

An examination of these results shows that with the exception of hog brains and pig embryos, those substances which contain no iodine are unsuitable for feeding animals over a long period of time. In the early experiments white mice were used, but as they did not thrive upon the diet of chocolate and almonds, many of them dying within a few days, dogs were substituted, and the foods used were at first hog brains, and later pig embryos from which the thyroids had been excised. In the earlier part of the work, the diet of the dogs consisted exclusively of hog brains and distilled water. Inasmuch as hog brains contain a small amount of iodine, each dog received from 0.01 to 0.02 mg. of iodine daily. Estimations show that the ordinary diet of a dog in the kennels per day contains 0.23 mg. of iodine, a little more than ten times the amount received upon a diet of brains. Difficulty was experienced in keeping the dogs in good condition on account of the apparently irritating effect of the brain upon the gastro-intestinal tract. Many of the animals vomited soon after feeding, and all of them suffered more or less constantly from diarrhœa. This so lowered their resistance that many died within a few weeks of broncho-pneumonia or distemper.

When it was discovered that pig embryos contain only a minimal amount of iodine and that this small content is apparently entirely localized in the thyroid, the diet was changed from brains to pig embryos from which the thyroids had been excised. Although the animals lost considerable weight upon this diet, still their general condition was very

[1] Aided by a grant from the Rockefeller Institute for Medical Research, New York.

much better and the promise of life longer. Distilled water has been used for drinking purposes throughout the experiments. The animals have been kept in cages continuously, so that no other food than that given could be obtained.

In the following histories four of the dogs were fed on hog brains and three on pig embryos. The period of life has varied from 11 to 64 days. In each case a small piece of thyroid, to be used as a control, was excised at the beginning of the experiment.

Dog 2607. Diet hog brains. Duration of life 32 days. The dog was bright and active at the beginning of the experiment but soon began to lose weight, and during the last two weeks suffered continuously from bloody diarrhœa. The animal lost ⅜ of its original weight. The cause of death was intestinal hæmorrhage and ulceration due to parasitic infection. The thyroids were pale and opaque but otherwise normal. Histological examination of the piece excised showed marked irregularity in the form of the alveoli. The epithelial cells were high cubical in form. The colloid was subnormal in amount. The portions at autopsy showed the alveoli still somewhat irregular in outline. The epithelial cells were high. The colloid was absent from some of the alveoli, but others showed the presence of a good deal. In comparing the two sections it was found that the colloid in the thyroid at autopsy was increased, otherwise there was no change. Weight of the thyroids 0.28 gm. Iodine content 0.38 mg.

Dog 2807. Diet hog brains. Duration of life 14 days. The animal suffered constantly from bloody diarrhœa and became much emaciated. At autopsy the thyroids were quite pale but normal in other respects. In the excised piece the alveoli were lined with low epithelium, were fairly regular in outline and contained colloid. After feeding the alveoli were apparently much larger and contained more colloid, which seemed to penetrate into the intra-alveolar spaces. The lining epithelium was flattened. Wet weight of thyroids 0.55 gm. Iodine content 0.023 mg.

Dog 1708. Diet hog brains. Duration of life 51 days. The dog became progressively thinner throughout the experiment, losing six pounds, one-half of its original weight. During the last three weeks the animal was very weak, being scarcely able to stand. The gums and lips became swollen and spongy, and at autopsy exhibited a gangrenous condition. The cause of death was broncho-pneumonia. Both lobes of the thyroid were of the same size and were somewhat smaller than normal. They were so translucent that the vessels within the depths were easily visible. The consistency was slightly increased. Microscopical examinations of the excised piece showed marked infolding of the alveoli, and high cubical or cylindrical epithelium. There was relatively little colloid, and great variation in the size of the alveoli. The thyroid after feeding presented practically a normal appearance. The whole gland was made up of round alveoli lined with flat epithelium. The alveoli were filled with homogeneous colloid. In this animal there is a reversion from a distinctly hypertrophied thyroid to the normal type of gland with marked increase in the amount of colloid in the alveolar spaces. Wet weight of thyroid 0.55 gm. Iodine content 0.27 mg.

Dog 2108. Diet hog brains. Duration of life 14 days. The animal had diarrhœa from the start and rapidly became much emaciated. The cause of death was broncho-pneumonia. The thyroids at autopsy were quite normal in appearance. The excised pieces showed great variations in the size of the alveoli, only the larger ones containing colloid. They were irregular in outline and lined with high cubical epithelium. The thyroid after feeding was much nearer to normal in appearance. It was composed of alveoli of fairly uniform large size, lined with flat epithelium and distended with colloid. Iodine content 0.18 mg.

Dog 2808. Diet pig embryos. Duration of life 43 days. There was a loss of .five pounds in weight during the experiment. The cause of death was broncho-pneumonia. The thyroids appeared to be somewhat larger than at operation and slightly firmer than normal. The excised piece showed alveoli of moderate size and somewhat irregular outline. But few of the alveoli contained colloid. The epithelium was cylindrical in type and showed some infolding. In the thyroid at autopsy there was a definite increase in the size of the alveoli. Slight irregularity in outline was still apparent. The alveoli were filled with colloid. The epithelium was cubical in type and showed no infolding. Wet weight of gland 1.45 gm. Iodine content 0.29 mg.

Dog 4708. Diet pig embryos. Duration of life 14 days. The animal was quite healthy up to the 14th day of the experiment when it died suddenly. The autopsy revealed extensive broncho-pneumonia. The thyroids showed slightly increased consistency. The excised piece of the thyroid was normal in appearance. The thyroid after feeding showed no very apparent change. There was possibly a slight increase in the average size of the alveoli, and in the total amount of colloid. Wet weight of thyroid 1.0 gm. Iodine content 0.5 mg.

Dog 3308. Diet pig embryos (thyroids excised), 15 gms. C. P. lactose, and 20 gms. lard per day. Duration of life 72 days. The animal became progressively thinner and weaker during the experiment and at the time of death was extremely emaciated. The autopsy revealed no other anatomical lesions as the cause of death than the extreme emaciation and apparent starvation. The hair had fallen out in patches over the forehead, ears and sides of the neck. Over the chest numerous smaller areas were completely devoid of hair. The hair did not grow out over the shaved incision. There was marked œdema of the subcutaneous tissues of the anterior portion of the neck. A less marked degree of œdema extended over the chest and back. The fat in the subcutaneous tissue had disappeared and its place was occupied by an œdematous tissue from which fluid exuded on incision. The organs were all normal with the exception of the liver, which showed focal necroses. Both thyroid lobes were large and very firm. They were extremely pale amber in color, and so translucent that blood-vessels could easily be seen in their depths. The alveoli were enlarged and could be distinguished with the naked eye.

Microscopic examination of the piece excised before the experiment shows a practically normal gland. The alveoli are lined with flat epithelium and contain abundant colloid. In the thyroid, after feeding, the alveoli are uniformly round and quite large. They contain very abundant colloid. The alveolar walls are thin and the epithelium flat. Wet weight of thyroid 2.4 gms. Iodine content 0.9 mg.

Consideration of the above results shows that in every one but one the colloid in the thyroid at the end of feeding was more abundant than that seen in the pieces excised at the beginning of the experiment. Those glands which showed a hypertrophied condition have tended to revert to normal with accumulations of the colloid in the alveoli and a marked flattening of the epithelium. With the increase in the amount of colloid several of the glands showed a rather high iodine content despite the small amount of iodine contained in the food.

It has been suggested by Dr. Halsted's work that mere handling of the gland or excision of a small piece might result in hypertrophy. In view of this supposition, the thyroids of 10 dogs were examined after they had undergone considerable handling at operation and after several small pieces had been excised. In two a low grade of hypertrophy was observed. The thyroids of two showed no change, and in six there were distinct evidences of increased colloid and flattened epithe-

lium. Whether the increase in the colloid content of the thyroids in the experimental animals was due to the diet, or to the diminished call of the tissues for thyroid secretion because of the inactivity of the caged animal, has not yet been determined. Dogs are now being kept caged and fed on normal diet to see if the thyroid undergoes the same change as that observed in animals fed on iodine-free food.

All of the animals fed lost a great amount of weight, so that the food value of pig embryos is being determined in order to make up whatever deficiency there may be in the amounts of proteid, carbohydrate, fat, and salts. The greatest difficulty has been experienced in keeping the animals free from intercurrent infections. The dogs that are being fed now will be muzzled and turned out into the yard every day so that the normal mode of life of the animal may be duplicated as nearly as possible.

CHANGES IN THE PANCREATIC DUCTS, AND THEIR RELATION TO CHRONIC PANCREATITIS.

By M. C. WINTERNITZ, M. D.,

Fellow in Pathology, Johns Hopkins University.

In a recent autopsy performed at Bay View Asylum, the pancreas presented such an unusual combination of pathological changes that at the suggestion of Dr. W. G. MacCallum it is herewith reported.

History of Case.—J. D., white male, age 49, was for many years an inmate of the almshouse. Towards the end of the past summer he was admitted to the medical wards, complaining of swelling of the legs and pain in the abdomen, especially on the left side. He was found to be suffering with "cardiac breakdown," probably due to chronic nephritis. There was decided pain on pressure in the left epigastric region, though no tumor was felt. Gastric analysis showed: total acidity, 16; no free hydrochlorie or lactic acid. It was thought he might be suffering from gastric carcinoma. His condition became steadily worse and he died on September 30, 1907.

Anatomical Diagnosis.—Bronchopneumonia; chronic interstitial nephritis; myocarditis; cardiac dilatation, and hypertrophy; perieardial effusion; chronic mitral, and trieuspid endocarditis (mitral and trieuspid insufficiency); chronic passive congestion of abdominal viscera; arteriosclerosis; pulmonary emphysema; chronic gastritis, and enteritis; localized chronic pancreatitis; adenoma arising in pancreatic duct; bilateral hydrocele; hypertrophy of prostate.

Pancreas is of normal size and consistency. The lobulation is distinctly made out, but not excessively prominent. On section it is semi-transparent, of a dull grayish-white color. The islands of Langerhans are seen as opaque yellowish dots. A probe can be passed from the middle of the gland, through the duet of Wirsung into the duodenum with ease. (A portion from posterior third of pancreas, about 3 cm. in length, was preserved for further study.)

Microscopical Note.—In the lower third of the triangular cross-section were several areas of connective tissue infiltrated with round cells. These contained only atrophic islands of Langerhans (Fig. 1). Besides these areas, several large ducts, much larger than those seen anywhere else in the section, were found lying close together. The epithelium was of the high cylindrical type, but instead of being a single layer of cells, they were arranged in curious folds which projected into the lumen, while lying free in the duct were island-like structures with a layer of similar epithelium about them, and a loose cellular connective-tissue core (Fig. 2).

In an effort to correlate this localized pancreatitis with the changes in the ducts, serial sections were made from the original block. These will be described beginning with the most proximal. Each is a complete cross-section of the gland.

In general, the acinar parenchyma is perfectly normal in appearance, as are also the islands of Langerhans. The interacinar connective tissue is increased slightly throughout. The ducts everywhere are surrounded by a considerably thickened fibrous wall, which is poor in nuclei, and stain intensely with eosin. Around the larger ducts more especially, these hyaline-like areas contain numerous small tubular structures, which in places can be seen budding from the main duet. These are all lined by a single layer of cubical epithelium.

With but little gradation there appear several large bizarre-shaped ducts lying close together, whose epithelial lining is arranged in papillary folds, now appearing as a double row of cells lying base to base, now forming a serrated edge, and in places apparently fusing to form tubular structures lying free in the duct, or island-like structures as described above. Here and there the basement membrane appears broken, allowing these folds to project into the surrounding dense connective tissue. Everywhere accompanying the change in the ducts, the acini are extremely atrophic, occurring as clumps of shriveled cells, while the interstitial tissue is markedly proliferated and studded everywhere with many small ducts and an occasional island of Langerhans still quite normal (Fig. 3). There is a considerable infiltration of small round cells, more marked about the larger ducts, and occasionally a plasma cell or eosinophile is seen. The veins are markedly dilated with blood, while the arteries are contracted and have thickened walls. The epithelium lining these atypical ducts, as that also of the smaller tubules, is no longer cubical but extremely high, staining intensely with eosin, and seemingly full of secretion. The nuclei may be flat, round, or oval, usually pale, rarely staining deeply or showing some stage of division (Fig. 4).

As one passes distalward it becomes evident that one duet shows a greater change than the others. It is markedly di-

lated, while its lumen is filled by a large papillomatous, cauliflower-like epithelial formation. The wall is much thickened by many layers of fibrous tissue, everywhere interrupted by larger or smaller tubules, separated from the lumen of the large duct sometimes by only a few strands of tissue. These smaller ducts followed through a number of sections show all the above described changes of their epithelial coat.

Contrary to what might be expected, the connective-tissue overgrowth is not so marked. Each duct is imbedded in a mass of fibrous tissue, but surrounding these are large areas of adipose tissue interrupted by masses of connective tissue containing islands of Langerhans and ducts of varying forms (Figs. 1 and 3). Occasionally islands of Langerhans are seen isolated in the fatty tissue. In other places where the changes in the duct are not so decided there is a marked chronic interacinar pancreatitis. These degenerations follow the ducts systematically, and it is instructive to note that as the ducts become more atypical in one region and less so in another how the changes in the parenchyma shift their position.

The whole picture becomes more intense as the tail is approached. The altered ducts become more and more numerous. Occasionally one will be found cut longitudinally, showing a more complete system of folds and new sprouts, and in one area apparently breaking up into many ducts of varying size (Fig. 5). The last section shows a cumulative picture of the above changes and at least half of the pancreatic tissue has been destroyed.

Localized pancreatic cirrhosis is not a very common occurrence. McClure reports a case, in which a calculus lodged in the posterior portion of the duct of Wirsung in a dog, caused a similar microscopic picture of the parenchyma as above described. He, however, makes no statement as to the condition of the ducts in the atrophic area; though in the gross he says, minute bulgings could be seen in the proliferated connective tissue, and the main duct was greatly distended. A similar case is reported by Whipple, where the ducts are large and dilated beyond the point of obstruction. Likewise Schmidt, and many others have reported cases, but in the majority of these there is an involvement of the entire pancreas distal to some obstruction.

Herxheimer described five cases, in which the pancreas showed areas where the parenchyma was either entirely atrophied, or only small remnants of the acini remained embedded in dense overgrowth of fibrous tissue. The islands of Langerhans still persisted, showing little atrophy. These areas of sclerosis were rendered the more conspicuous by either lying around dilated large ducts or by having small ducts scattered through them. He thinks this change due to some obstruction of the ducts, which he, however, was unable to find. He theorizes on the possibility of some toxic agent causing a primary necrosis of the parenchyma with the consequent new formation of connective tissue, which might so contract around a duct at some point as to effectually narrow its lumen. This would cause the normal secretion to be dammed back with the above described results. Dieckhoff had previously suggested this. Herxheimer further thinks such a stagnation would favor the formation of calculi, which would assist the process.

There are few pathological conditions of the epithelial lining of the ducts reported. Gutmann, in a case of chronic pancreatitis in which the clinical diagnosis of diabetes mellitus was made, describes the change in the ducts as follows: The main duct, embedded in dense fibrous tissue where the pancreatic tissue is markedly atrophic, is surrounded by numerous small ducts of various forms, lined by a single layer of cubical epithelium. These are occasionally seen to connect with the main duct. In the larger ducts one sees round or forked papillæ projecting into the lumen, and occasionally structures lying free in the lumen, composed of a connective-tissue framework lined by a cylindrical layer of epithelium. He argues that there must be an increase in the ducts here, and that one might speak of an adenomatous proliferation. Lazarus and Steinhaus have described similar cases occurring in connection with cirrhosis of the liver.

Reitmann, in a case of chronic pancreatitis, describes areas where many large ducts unite to form curiously shaped cavities. These ducts are nowhere lined by normal epithelium. One often finds several layers of cells which cover a much-folded basement membrane. There are many small ducts formed by budding processes from the larger ones.

Herxheimer, in a case of chronic pancreatitis, says: "In places where the connective tissue is proliferated most markedly, there are large numbers of small ducts which present a picture of adenomatous change. In several places the epithelial lining had so proliferated as to practically occlude the lumen. These duct changes were present in markedly cirrhotic areas where only ducts and islands of Langerhans were to be seen." Ssobolew, Anschütz, Fleiner, and others have also noted this condition.

Gutmann reports a case of adenocarcinoma of the pancreas with metastases to the liver, peritoneal, and pleural cavities in which he describes the much convoluted ducts lined with a single layer of high columnar epithelium. The nuclei stain deeply, are round or oval, and are placed at the base of the cell. The metastatic nodules have the characteristics of a pancreatic tumor.

Hulst adds two cases of primary adenocarcinoma arising in the head of the pancreas, the first with metastasis to liver, the second to the liver and lymph glands. In these cases the pancreas was not much altered in form. Microscopically the parenchyma was either destroyed or extremely atrophic, on account of the overgrowth of connective tissue, which he thinks was caused by the "sialangitis" and "peri-sialangitis," rather than by the tumor. There were many ducts close together, showing papilli-form proliferations, composed of large, cylindrical cells, with large, oval, pale-staining nuclei usually basal, and occasionally showing mitoses. These ducts were occluded by the proliferations, and in places seemed to break through the duct wall, forming secondary tubules of similar character. He thinks these tumors arise in the ducts of the pancreas, and adds that without the occurrence of metastasis, it would be very difficult, after seeing many cases of acute and chronic

pancreatitis, damming back of secretion, tumor, etc., to diagnose any single case as one of malignant adenocarcinoma. He thinks the diagnosis possible, however, without the occurrence of metastasis, because while the increase in the number of ducts is claimed by some to be explained by simple chronic inflammation, the tubular structures being not really ducts, but the remains of the atrophic parenchyma, he finds that the atrophic acini are surrounded, and separated from each other by newly-formed fibrous tissue, and that their lining epithelium always have the characteristics of resting cells, showing a simple atrophic degeneration. On the other hand, the tubules which are of new formation are much larger, have irregular nuclei, of varying size, form, and chromatin content, with increased amount of cellular protoplasm.

He referes to two other cases found by Seehbohm and Ruggi and says they are found sparsely in the literature. Gutmann reports a somewhat similar case where the tumor developed in the body while the head was normal. The ducts showed practically the above described change. He regards his case similarly as a primary adenocarcinoma of the pancreas, but thinks it impossible to state its absolute histogenesis, inclining, however, strongly to the view that the ducts are the primary seat of change. He quotes Orth, Ribbert, Lubarsch, Kaufmann, Dieckhoff, etc., as considering such growths to arise in the ducts.

On examining a large number of sections taken from normal glands, and those presenting various pathological changes, with special reference to the condition of the ducts and connective-tissue proliferation, several very interesting changes were observed.

1. Chronic pancreatitis of all degrees and types occurs in which the ducts are quite normal.

2. It is not uncommon to find a thick wall of connective tissue about the ducts, even the smallest ones, in a relatively normal pancreas, where there is no other increase in fibrous tissue. In this thickened wall many small ducts can be seen budding from the larger ones. These are usually lined by a single layer of low cubical epithelium (Fig. 6). This has been observed by Langerhans and others who think it a process of regeneration.

3. Here we have all the characteristics of group 2, plus a large dilated duct which is quite frequently of an irregular shape. The epithelial lining is somewhat higher than normal, and curiously enough, the small ducts are usually lined by a similar layer of cells instead of the low cubical variety that one would expect to find in a tubule of that size. These cells are quite uniform, but in one case (J. H. H. Autopsy No. 2263) the nuclei show a more variable shape (Fig. 7). In none of these cases was there any marked constriction along the duct.

4. In this group the ducts are not only dilated and lined by high cubical epithelium, but the epithelium projects into the lumen as papillary folds, often cut in such a way that they appear as the island-like structures above described. It is interesting that two of these specimens (J. H. H. Autopsy Nos. 1867 and 2274) were obtained from cases clinically diagnosed diabetes mellitus. A third case (J. H. H. Autopsy No. 2513) shows the same process in several large ducts lying close together.

5. There is often a marked increase in the number of atypical ducts. J. H. H. Autopsy No. 2583 showed a carcinoma of the papilla of Vater which compressed the common bile duct as well as the pancreatic ducts, causing marked cystic dilatation of the latter. A probe could be passed through the ampulla, showing that the occlusion was not complete. The ducts, however, were not only enlarged but distinctly increased in number. In one area several large ducts, surrounded by numerous smaller ones, filled the field of the microscope (Fig. 9). They were all well preserved and showed none of the retrogressive changes, seen everywhere in the surrounding acinar parenchyma. A similar condition was found in (J. H. H. Autopsy No. 1884), a case of secondary sarcoma of the pancreas, in which there is no marked dilatation of the ducts, but an increase in their number. This increase in the number of ducts found in any single area is probably often to be explained by their concentration following the atrophy of the intervening tissue and by the formation of new sprouts from the old duct in an attempt at regeneration. But as in the case above described, where the ducts were clumped in only one portion of a cirrhotic gland and were all larger than the majority of those found elsewhere, it seems justifiable to conclude that there was a new formation of ducts.

6. The case reported at the beginning of this article and the following one illustrate another group. Here there are numerous large ducts lying close together, showing the peculiar cauliflower proliferations described in Group IV to a far greater extent. At autopsy the duct of Wirsung was considerably dilated. The bile and pancreatic ducts opened separately into the ampulla. Microscopically there was a much dilated central duct, surrounded by large ducts which seemed to arise from it, and which in their turn divided. These were all lined by a high cylindrical epithelium, arranged in folds which only occupied part of the much dilated lumina. These folds often formed tubules, which were free in the lumen or separated from it by varying amounts of fibrous tissue.

7. The most marked changes are shown in the following case. There is a marked fibrous pancreatitis, accompanied by great increase in the ducts which show malignant changes of their lining.

Autopsy No. 2914. Dr. Whipple.

Anatomical Diagnosis.—Cholelithiasis (stone in cystic duct with ulceration into duodenum); dilatation of hepatic ducts with subacute cholangitis and abscess formation; peri-pancreatic abscess; extreme chronic pancreatitis with cancerous change; stricture of duodenum; dilatation of stomach, subacute gastritis; anæmia; emaciation; hypertrophy of prostate.

Pancreas.—The tail of the pancreas shows no very striking change, but the head of the pancreas contains very dense elastic tissue which grates under the knife. This tissue appears to be a new growth arising from the head of the pancreas. It consists of a pale pearly-white matrix sprinkled over with yellowish pinpoint opacities. It surrounds the mesenteric vessels closely, and seems to invade the lymph glands in the neighborhood which are pigmented, but show some of this gray translucent tissue.

There is a small abscess cavity about 2 cm. in diameter between the lower portion of the duodenum and the head of the pancreas which is full of thin turbid yellowish fluid. Microscopically the parenchyma is almost entirely replaced by new growth and fibrous tissue. Here and there masses of small round cells are seen, while in other places accumulations of nuclear debris occur. The tumor is represented by large masses of ducts. These show many different forms, small ones clumped together, large dilated ones, etc. The epithelium lining these, where it is most characteristic (Fig. 10), shows many layers of cells which often appear only as masses of nuclei, the cell division no longer being distinct. These nuclei are of all sizes and show great variation in their chromatin content. Numerous nuclear figures are seen. In places the epithelium has proliferated so much that it extends as a papilla into the lumen. In other areas the basement membrane is interrupted and new ducts formed. The acinar tissue where it has not been entirely destroyed is extremely atrophic, the islands of Langerhans still persisting.

It would be difficult in this case to say which was the primary change. It is well known that cholelithiasis or in fact any simple inflammation of bile ducts, is of great etiological moment in causing hepatic as well as pancreatic cirrhosis (Riedel, Oser, Hulst, etc.). This is particularly so in the head of the pancreas, which might be affected by the inflammation about the bile duct, as it passes through the pancreatic tissue. In this case the chronic inflammation which seems of long standing, may have constricted the ducts in the head of the gland, while the cancerous change developed later. It will be remembered in the case above reported by Hulst, gallstones accompanied the adenocarcinoma of the pancreas. He likewise attributed the pancreatic cirrhosis in these cases to inflammation of the ducts, and thought the malignant change to be secondary. It must not be overlooked, on the other hand, that a large tumor of the head of the pancreas may press upon the ducts and cause an overgrowth of connective tissue due to retention of secretion. Just why damming back the secretion causes fibrous overgrowth and atrophy of the parenchyma is not understood. Opie says the interlobular form of chronic pancreatitis is often caused by duct obstruction, and quotes Carnot, who summarizes the various possible factors which may play a part in this process. Retained secretion, he believes, has a toxic action upon the acinar cells. Obstruction to the outflow of fluid from the ducts favors the entrance of bacteria from the duodenum. Carnot suggests, moreover, that reflex nervous stimuli, which normally reached the secreting cells, are no longer capable of exciting normal functional activity, and deprived of this influence the cells atrophy as do muscle fibres after section of their motor nerves.

More obscure than this are the changes in the duct epithelium following obstruction. With increased pressure in the ducts one would naturally expect a flattening of the lining cells. This is found in some large cysts where either no cells or a flat epithelial lining occurs. In some, on the other hand, occasional clumps of high cylindrical cells are found. In the above cited cases we see dilated ducts with hypertrophy of the epithelium which may form papillæ, new ducts, or a more malignant growth. Similarly it is well known that in cysts of the breast, the epithelial lining is very prone to hypertrophy, forming papillæ, which in turn frequently give rise to malignant growth.

Conclusion.

We have seen several types of change in the pancreatic ducts which seem to gradate into each other. All of these were accompanied by varying degrees of chronic pancreatitis.

1. Simple increase of the connective-tissue wall about otherwise normal ducts.

2. Dilated thick-walled ducts with high columnar epithelium.

3. Ducts in which the epithelium has hypertrophied to form papillæ.

4. Absolute numerical increase of the ducts which may be regarded as a regenerative change and in some cases as an adenomatous proliferation.

5. Ducts in which the epithelium has proliferated to such an extent that not only papillæ but new tubules are formed.

6. Ducts whose epithelium has undergone malignant change.

We have then two definite types of adenoma, or benign proliferation of the ducts, the one where there is a simple increase in the number of ducts, the other where the epithelium of these ducts shows the curious hypertrophic changes described. These two types often seem to merge into one another. Likewise it is often difficult to say when the latter has lost its benign characteristics and become malignant.

The question arises what connection these duct changes have with the chronic pancreatitis.

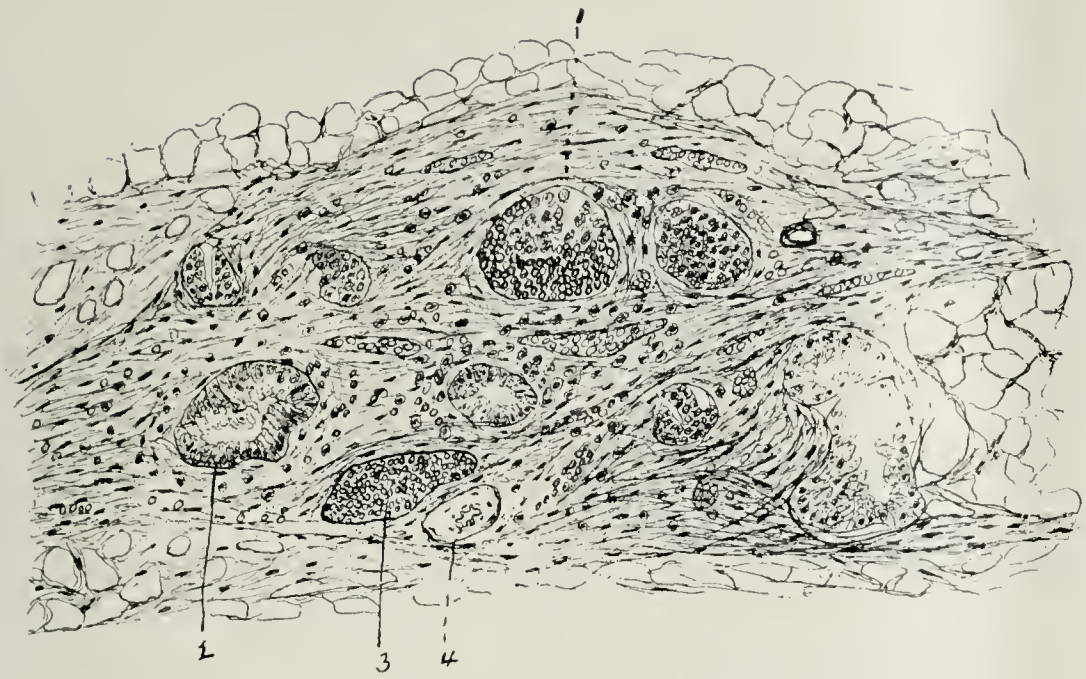
1. The changes in the ducts, particularly their new formation, might be an effort on the part of the pancreas to regenerate after chronic inflammatory processes. This has been suggested by Herxheimer and others, but it seems hardly probable, as the duct epithelium is so entirely different from that of the acini, and shows no gradation anywhere into acinar tissue.

2. This infolding is no doubt sufficient in some cases to cause obstruction to the outflow of secretion and dilatation of the ducts with atrophic changes in the acini.

3. The change in the ducts and the fibrous overgrowth may be due to a third process. In many cases this seems the more likely, as the ducts are much distended, as the result of some form of occlusion, and the papillæ occupy only part of their lumen.

In conclusion, I wish to thank Dr. W. G. MacCallum for his assistance in this work.

N. B.—Since this article was written, another case has come to my notice. Here there was a carcinoma of the bronchus with extensive metastases to the liver. A section from the tail of the pancreas showed several areas of localized pancreatitis. In one of these nothing remained but the islands of Langerhans, and two large ducts whose epithelium was high and infolded. In several other areas the ducts showed hypertrophy of their lining epithelium, and in still others numerous small ducts were grouped about a larger one. Surrounding all of these ducts there was an increase of fibrous tissue, which extended for a variable distance into the neighboring pancreatic tissue.



1. Island of Langerhans.
2. Cross section of duct.
3. Dilated Veins.
4. Artery.

FIG. 1.

FIG. 4.

FIG. 2.

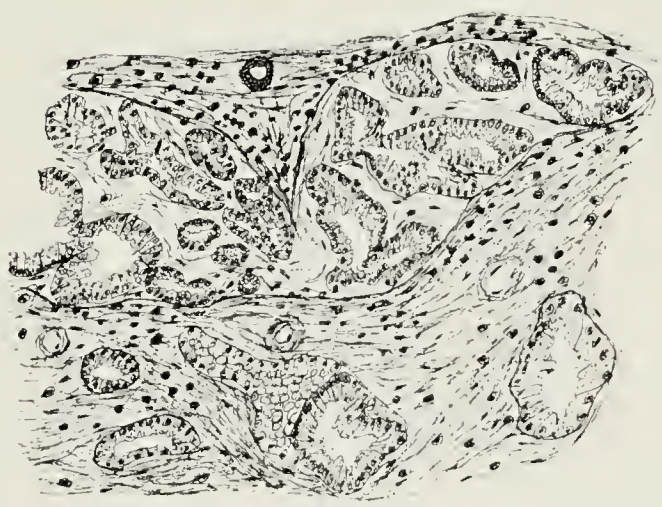


FIG. 5.

FIG. 3.

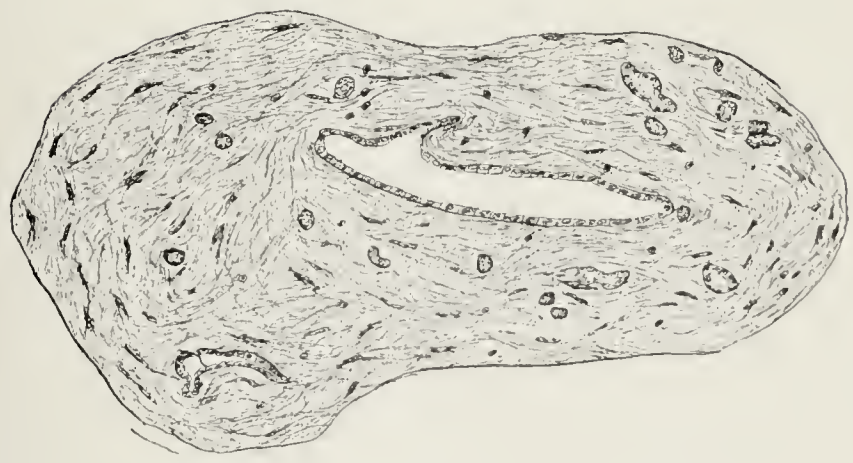


FIG. 6.

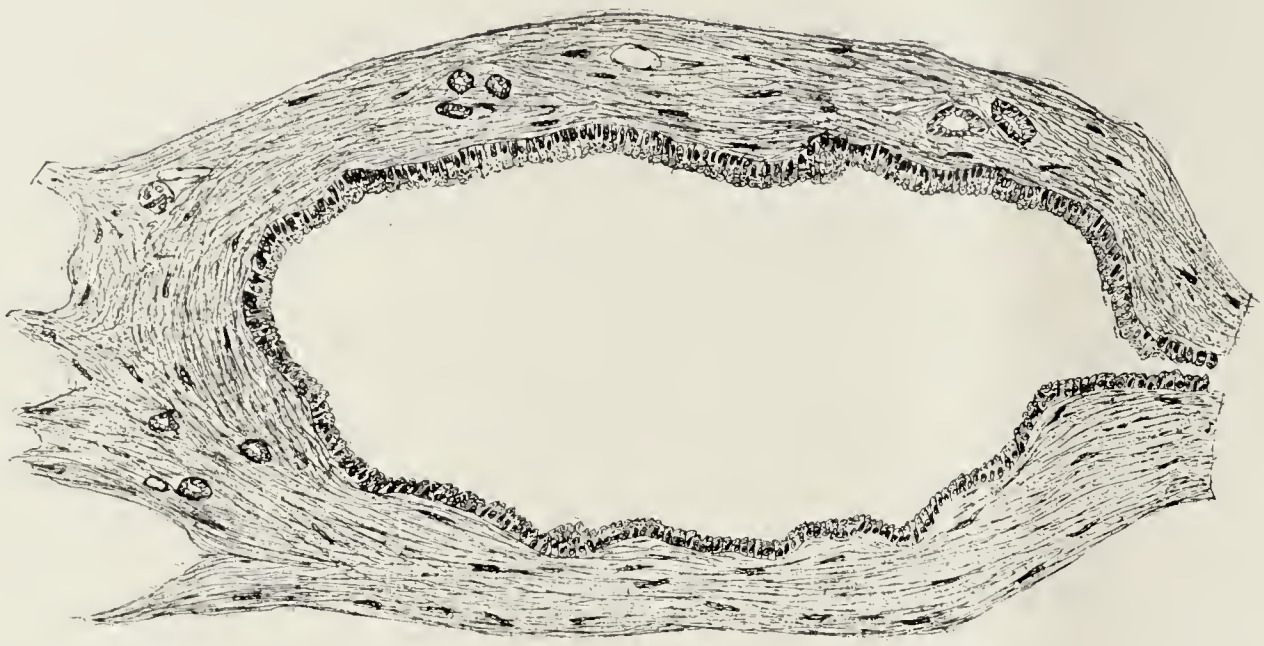


FIG. 7.

FIG. 9.

FIG. 8.

FIG. 10.

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THE PHIPPS PSYCHIATRIC CLINIC IN CONNECTION WITH THE JOHNS HOPKINS HOSPITAL.

Upon the 12th day of June, after several conferences between Mr. Henry Phipps and Doctors Welch, Barker and others, representing the Johns Hopkins Hospital, the following letter was received from Mr. Phipps:

I understand that there is urgent need in this country in connection with university medical schools and their hospitals for institutions similar to those known as psychiatric clinics, to provide for the better care of patients suffering from mental disease, especially in its earlier and often curable stage, under conditions similar to those of a general hospital.

Since patients may enter such an institution without the formality of commitment, and without the stigma which is popularly thought to pertain to admission to an asylum for the insane, experience has demonstrated that many may be rescued from permanent insanity by early treatment in an institution of this character.

A psychiatric clinic, as thus understood, should also afford much needed opportunities for the instruction of medical students and physicians in this important field of medicine, and should be equipped with laboratories for the scientific investigation of the nature, cure and prevention of mental diseases.

It gives me pleasure to offer to the Johns Hopkins Hospital the funds necessary for the erection and equipment of a psychiatric hospital on its grounds, in accordance with the plans and estimates which you have submitted; the institution to provide for about sixty patients, and to contain the necessary laboratories and other facilities, and furthermore to offer to the Johns Hopkins University additional funds for the establishment of a professorship of psychiatry, and the assistantships thereto, the professor to be also the director of the psychiatric hopital.

I have arranged to provide for the maintenance of the hospital and of the professorship for a period of ten years from the time of the opening of the hospital.

It is my desire that in the admission of patients to the hospital preference should be given to applicants from Baltimore, and from those cities with which my life and work have been so closely associated, Pittsburgh, Philadelphia, and New York.

It is my hope and expectation that the psychiatric clinic thus founded may serve as an example of what such institutions should be, and prove to be a stimulus to the establishment of similar hospitals and professorships elsewhere.

This offer was accepted by the Trustees of the Johns Hopkins Hospital at a special meeting upon the 17th of July, in the following terms:

Resolved, That the noble and munificent gift of Henry Phipps, Esq., be herewith gratefully accepted on the terms expressed in the above-mentioned letter, and that the Superintendent be requested to write to the donor to express the sincere thanks of the Board of Trustees for the liberal generosity which he has shown heretofore to the Johns Hopkins Hospital, and for this new expression of his interest in its work; and for the confidence he has manifested in entrusting to the Trustees the task of carrying out his philanthropic efforts to promote the hospital treatment of mental and nervous diseases and thus to alleviate the sufferings of mankind.

Resolved Further, That Henry Phipps, Esq., be requested to allow the new psychiatric clinic to bear his name in perpetuity as one of the departments of the Johns Hopkins Hospital.

Resolved Further, That a copy of these resolutions accompany the letter of the Superintendent to Henry Phipps, Esq.

Subsequently, upon the 19th of June, the Trustees of the University adopted a minute of similar import.

The Trustees of the University and Hospital also united in appointing Dr. Adolph Meyer, Director of the Pathological Institute of the State Hospital of New York, to the position of Director of the Clinic and Professor of Psychiatry in the Johns Hopkins Medical School.

The newly appointed Director of the Clinic is a native of Switzerland and received the degree of Doctor of Medicine from the University of Zürich in 1892, after studies at Paris, Edinburgh, London, Vienna and Zürich. He came to America in 1892 and was made an Honorary Fellow of the University of Chicago for one year and was later Docent from 1893-1895. In 1893 he was also made Pathologist of the Illinois Eastern Hospital at Kankakee and remained in residence there until 1895, when he resigned both positions to accept the post of Pathologist in the Worcester Insane Hospital. He was also Docent in Psychiatry in Clark University. He resigned these positions in 1902, when he was appointed Director of the Pathological Institute of the State of New York and at once entered upon the duties of this position. He reorganized the work of the Institute and brought the different institutions throughout New York into harmonious relations with it. In addition to the routine work of instruction, he made regular visits to institutions to become familiar with the work of their medical officers and held clerical conferences with them. He has always been a voluminous and forceful writer, as the bibliography appended to this note will testify. He was appointed Professor of Psychiatry in the Cornell University in 1904. He received the degree of LL. D. from the

University of Glasgow in 1901. He is also a member of many medical societies.

Dr. Adolph Meyer has accepted the Professorship of Psychiatry and the Directorship of the Clinic and is to begin his service October 1, 1909. He goes abroad at an early day to accompany Mr. Phipps and Mr. Grosvenor Atterbury, the architect selected to draw plans for the building, upon a tour of inspection of the best and newest psychiatric clinics in Europe.

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PROCEEDINGS OF SOCIETIES.

THE JOHNS HOPKINS MEDICAL SOCIETY.

May 4, 1908.

Meeting of the Johns Hopkins Hospital Medical Society, Dr. Hurd presiding in the absence of the president, Dr. Finney.

I. Exhibition of a Case—Ichthyosis Hystrix. Dr. Lord.

The case was that of a white child, aged 5 years, who was suffering from ichthyosis hystrix, or congenital warts. The child was born with a brown discoloration of the abdomen, neck, hands, and feet. Shortly after birth warts began to develop throughout these areas of discoloration. During the last eighteen months the warts have increased rapidly. The child has no symptoms except itching. In some places the warts seem to follow the nerve tracts, but in other places this mode of distribution is not so evident. During the past week the patient has undergone treatment with X-rays, but thus far his condition has not improved.

II. The Cause of the "Loco" Disease. Dr. Crawford, Washington, D. C.

The speaker described in detail the results of his investigations of the cause of the "loco" disease, a definite, complicated disorder that occurs in range animals and the cause of which has been laid to the eating of certain leguminous plants. In Australia experimental work has shown that the disease occurs in cattle after eating the loco plant.

The symptoms in an ideal or typical case are of two kinds: gastro-intestinal and those referable to disturbances of the central nervous system. Post-mortem examinations have failed to reveal any lesions that may be called characteristic except ulcer of the stomach in some cases and dilatation of the vessels of the dura mater.

Dr. Crawford first fed rabbits an aqueous extract of the plants and found that the animals would die within a very short time with acute symptoms of poisoning. Two hundred grammes of the dried plant would produce the same result. He then fed rabbits with repeated small doses. Such animals emaciated and died usually in 10 days. They all showed peculiar psychical symptoms, which resembled very closely the mental condition of "locoed" range animals. These animals also aborted fairly regularly—another symptom that is common in poisoned range animals. He was able, therefore, to reproduce the important symptoms that occur on the range.

All attempts to isolate an active principle from the plants were unsuccessful until he found barium present in the ash of the dried plants. This metal occurred in very large amount, 200 grammes of the dried plant contained 76 mg. of barium acetate, while another sample of 200 grammes of dried plant contained 173 mg. of barium acetate. He then fed rabbits repeated small doses of barium and found that they developed symptoms of acute and chronic poisoning that were like loco poisoning.

He found that some loco plants have barium in an insoluble form. Such plants, however, are very toxic to rabbits if the animals are given the digested products of the plants. If the barium was removed from such a digested product and an animal was fed on the barium-free residue, the animal was not harmed; but if now the barium was reintroduced, the animal promptly died. There were also some loco plants from particular sections of the country that contained no barium. Every one of these plants was physiologically inactive.

These studies showed that the occurrence of the loco disease depends upon the prevalence of barium in the soil of the ranges over which the cattle grazed, that the metal is taken up by the plants, which upon ingestion produce symptoms of poisoning, and that the barium not only must be present in the plants, but must occur in such form that the gastro-intestinal tract can render it soluble for digestion.

Discussion.

Dr. Futcher thought it appropriate that Dr. Crawford had brought his work before this society, since it was 7 years ago since Dr. Marshall had reported here the results of a pathological investigation of this disease in Montana. At that time Marshall concluded that the symptoms of the disease were not due to eating the loco plant. He had observed that all the animals suffered from intestinal parasites and he, therefore, considered the symptoms due to this cause. Dr. Crawford

seems to prove conclusively that the disease is due to some inorganic salt, probably a salt of barium.

Dr. Barker expressed his great satisfaction that the loco problem now seemed to be definitely settled. He recalled that 15 years ago brains of cattle affected with this disease were being sent to the laboratory with the view of determining the pathological cause of the affection. For 50 years, at least, investigations have been going on in the effort to solve this problem, and anything throwing light upon it is of the greatest economic importance. He considered this work of Dr. Crawford's as one more instance indicating the tremendous importance of a knowledge of the part played by inorganic substances in the metabolism of animals and plants, a rôle that we are just beginning to understand.

Dr. Hurd recalled that in 1884, while on a ranch in California, he became interested in accounts given by men who had seen "locoed" animals for years. The Spanish word "loco" means crazy, and in the west the term had become almost synonymous with crazy. This gentleman, with whom he spent several weeks on the ranch, gave very graphic descriptions of the condition of the "locoed" animals. The animals seemed to suffer from queer delusions of space, which symptoms were apparently due to disturbances of the nervous system and were fairly constant. On his return from California Dr. Hurd brought with him a large quantity of the plant and submitted it to chemists for analysis, but they did not succeed in making an active extract. It seems that sheep herders when driven by hunger are in the habit of cooking and eating the young pods of the loco plant, but so far as Dr. Hurd knew no case of poisoning had been reported among them. It was, therefore, likely that the poison must be in the plant itself or in mature plants only.

III. Studies on Venous Blood-Pressure. Dr. Eyster and Dr. Hooker.

This paper will appear in the Johns Hopkins Hospital Bulletin.

May 18, 1908.

Meeting of the Johns Hopkins Hospital Medical Society, Dr. Finney presiding.

I. Hereditary Epistaxis Associated with Multiple Telangiectases of the Skin, Nasal, and Buccal Mucous Membranes. Mr. Hanes.

The speaker exhibited four members of the same family, all of whom were subject to recurring epistaxis and who presented on the face and buccal and nasal mucous membranes small telangiectases. In this same family, in four generations, nine members have been afflicted with the same condition.

Case 1.—Mrs. M. R., aged 53 years, has been subject to severe nosebleed for 43 years. Her mother, who died at 48, was a lifelong sufferer from recurring epistaxis, and had upon her face and lips and within her mouth, numerous red spots, similar to those on the patient's face and lips. The patient's two brothers exhibited practically the same condition. Her own attacks of epistaxis have persisted since childhood and have been extremely frequent. She does not bleed excessively from injuries. With the growth in severity of the epistaxis telangiectatic spots have appeared upon her face, lips, and tongue. During the past two years her condition has grown progressively worse. At present she is very anæmic: her red blood count is 1,500,000 cells, and her hæmoglobin 15 per cent. Her coagulation time is 7 min., 50 sec. Scattered over the face, and especially numerous on the ears and lips, are small telangiectases, ranging from a pin-point to a green pea in size. These also occur in great numbers upon the sides and dorsum of the tongue, the hard palate, and the gums of the lower jaw. They are also present upon the fingers of both hands. Upon the conjunctiva of the right lower lid is a small one.

Cases 2 and 3.—J. F. R., aged 33, and T. R., aged 31, are sons of Mrs. M. R., the first patient. In them the facial telangiectases are larger and more numerous, but the epistaxis is less marked. Though they bleed only occasionally form the nose, they have frequent and profuse hæmorrhages after injury to one of the labial telangiectases. Under the nail of the left middle finger of J. F. R. are two telangiectases which arose after he had accidentally run a large splinter under the nail several years ago.

Case 4.—M. R., aged 18, daughter of Mrs. M. R., has suffered with severe and frequent epistaxis since childhood. This bleeding is usually spontaneous, though it may often result from slight trauma. At present her red blood count is 4,000,000 cells; her hæmoglobin, 78 per cent; and her coagulation time, 7 minutes.

T. R., the third patient, has two children: a son, 8 years of age, who frequently bleeds from the nose and who now has two small telangiectases upon the lower lip; and a daughter, aged 6, who has recurring epistaxis, but who shows no spots on the lips.

The speaker could find only seven such cases reported in the literature, and thought that many such cases have perhaps been diagnosed as hæmophilia. He emphasized, as characteristic features of the disease, its hereditary nature, the severe recurrent epistaxis, and the multiple telangiectases. The disease is serious and had ended fatally in several instances.

II. Relation of Tetany to Calcium Metabolism. Dr. MacCallum and Dr. Voegtlin.

Dr. MacCallum, after outlining a classification of the spontaneous types of tetany, confined his attention to the form of tetany that is definitely the result of parathyroid insufficiency. He described methods that have been used to combat it. Transfusion in dogs will stop tetany, and if a large quantity of inert salt solution be injected after bleeding an animal the tetany stops immediately, only to reappear after a short interval. Feeding of parathyroid emulsions seems to be ineffectual, but injections of parathyroid extract will control tetany.

The tetany seems to be of nervous origin. A muscle, severed from its nervous connections, does not become tetanic. At the same time the removal of cerebral cortex does not seem to affect the distribution of the tetany.

The speaker then gave the results of investigations that he and Dr. Voegtlin have made upon the action of calcium salts upon tetany produced in parathyroidectomized dogs. They found that if into such animals they injected a solution of the lactate or any other soluble salt of calcium (a 5 per cent solution), the dog almost immediately returned to normal. A

definite explanation of this phenomenon is at this time impossible, but the tentative hypothesis was advanced that perhaps the parathyroid glands exercise some control over the calcium metabolism, so that if they are excised or diseased there is an improper assimilation of calcium, which goes through the system without being used.

The speaker referred to Jacques Loeb and J. B. MacCallum, who have pointed out that the precipitation of calcium in tissues brings on twitching. He and Dr. Voegtlin have also found that sodium and potassium salts do not stop tetany in the way calcium does, and that while magnesium salts stop the tetany their toxic action is so extreme that the former action is masked.

The calcium also acts efficaciously if fed by mouth. It has been successfully tried therapeutically on two human beings who have suffered from tetany due to parathyroid insufficiency.

Analyses by other observers of the tissues of infants who have succumbed to the so-called infantile tetany have shown a deficiency of calcium, and the idea is gaining ground that such children may be cured with calcium. The tetany of lactation and pregnancy is perhaps explainable on the hypothesis that there is a calcium deficiency due to the draining of calcium from the system.

DR. VOEGTLIN described the chemical results of the investigation. An analysis of the brain, blood, urine, and fæces of tetanic dogs as compared with normal controls revealed the following facts: After parathyroidectomy there takes place a change in the metabolism favoring the excretion of calcium through the kidneys and the intestines. As a result of this the soft tissues and blood are found to contain only half the amount of calcium as compared with normal dogs. One remarkable feature is the change in nitrogen metabolism, which sets in soon after removal of the parathyroid glands. The ammonia ratio is greatly increased, from 5 to 25-40. This points towards the presence in the tissues and circulation of acids, the nature of which has not yet been determined. The ammonia content of the blood is found to be increased. From these data tetany may be explained as a condition in which there is an insufficiency of available calcium, for addition of more calcium removes promptly all of the symptoms.

III. The Results of the Use of Anti-meningitis Serum (Flexner's) in the Johns Hopkins Hospital in 1908. DR. SLADEN.

Before the use of this serum the results of the treatment of the cases of epidemic cerebro-spinal meningitis admitted to the Johns Hopkins Hospital had been as follows: During the years 1889-1907, inclusive, out of a total of 33 cases, there were 21 deaths and 12 recoveries—a mortality of 64 per cent. In all these cases the meningococcus was demonstrable in smears or cultures of the spinal fluid.

During 1908, 19 cases of acute cerebro-spinal fever have been so far admitted. The meningococcus was demonstrable in all of them. Of these 19 cases, all of which received the serum treatment, 16 recovered and 3 died—a mortality of 16 per cent. Of the three cases that died, one was a fulminant case; another was a child, 29 months old, admitted on the fourteenth day of the disease, who died 48 hours after admission from paralysis of respiration after having been kept alive for 16 hours by artificial respiration; and the third was a very stout colored woman who was admitted with a complicating broncho-pneumonia of both lungs and who died 48 hours after the first injection of serum.

Most of the cases are temporarily upset by the lumbar puncture and the injection of the serum. During the injection they usually complain of pain in the knees, or occasionally in the hips, or, as has twice happened, of pain about the rectum with the desire to defecate. These pains persist from 2 to 10 hours after injection, and following the injection there is usually a slight rise of temperature with increased restlessness. Urticaria and erythematous eruptions are not uncommon. It takes from 12 hours to 3 days before favorable signs and symptoms ensue. Favorable cases react to a certain extent after one injection. Some cases require but one injection, while others have taken as many as six. It has been the rule to give the serum daily until the temperature remains normal and to renew injections as soon as a recrudescence occurs.

The first effects are a fall in the temperature (following the initial rise), and subsidence of delirium, headache, pain in the neck and back, and general hyperæsthesia. Strabismus, stiffness of the neck, and Kernig's sign are more persistent, and Kernig's sign is often the last feature to disappear. Pressure signs and symptoms are thus seen to yield readily, although the amount of serum injected may be greater than that of the fluid withdrawn.

In the spinal fluid the polymorphonuclear cells increase in number after the first injection, but gradually disappear during recovery. The meningococcus, mainly extracellular in most cases, becomes intracellular after serum, and shows evidences of dissolution, staining much less distinctly.

IV. Hydrocephalus of Meningococcus Origin. DR. KNOX.

Will be reported later.

NOTES ON NEW BOOKS.

State Board Questions and Answers. By R. MAX GOEPP, M. D., Professor of Clinical Medicine at the Philadelphia Polyclinic. Price, $4.00. (*Philadelphia and London: W. B. Saunders Company.*)

The author states in his preface that the questions were selected from State Board examination papers, and that the volume "is to provide a convenient compend for the use of those who wish to prepare themselves for such examinations." The questions were not taken from any one State papers, but from those of "the larger and more representative States." The author claims no originality for the answers, many of which are taken verbatim from standard text-books. The contents are arranged under the headings of physics, chemistry, physiology, anatomy, hygiene, materia medica and therapeutics, practice of medicine, surgery, obstetrics,

gynæcology, pathology and bacteriology. The book has an extensive index, so that its use is much facilitated. A little more time given by the author to further classification of the questions would have made the work still more easy of use. It will no doubt, however, be warmly welcomed by a large body of young graduates of the medical schools. R. N.

Hygienic Laboratory. Bulletin No. 40. United States Public Health and Marine Hospital Service, 1908.

Of the four papers in this bulletin by Stiles, and Stiles and Goldberger, the first, in which Stiles described "The Occurrence of a Proliferating Cestode Larva (*Sparganum proliferum*) in Florida" is of special interest to medical men. This remarkable dermal infection has been described but once before by Ijima in a Japanese woman. The infection is characterized by the appearance of pin-point cysts or acne-like nodules in the skin or subcutaneous tissue. These may increase in size to that of a grain of rice. When the cyst is incised or ruptured by pressure, one or more minute plerocercoid-like larval worms may be found in a clear fluid or jelly. These worms have calcareous corpuscles, showing them to be Cestodes, but no genital system or other means of specifically identifying them. They multiply in the cysts by budding, so that as many as 7 worms have been found in one cyst. They vary in size from 0.3 x 3 mm. to 2.5 x 12 mm. and present very bizarre shapes due to the budding. The infection in the skin may reach many thousand cysts, resulting in lymphatic stases and a condition not unlike elephantiasis. The adult form of the parasite is entirely unknown, as is the source of the infection. Both the cases described lived directly on the sea-coast and subsisted largely upon marine fishes and molluscs. It is quite probable that a careful examination of fishermen on our Southern coasts will disclose other cases. Thos. R. Boggs.

Metabolism and Practical Medicine. By Carl von Noorden. Vol. I. Price, $6.00. (*Chicago: W. T. Keener & Co., 1907.*)

The first two volumes of this system have already been discussed in this journal. The volume under consideration is the third and last one and includes chapters on diabetes mellitus, gout and obesity by v. Noorden; rarer derangements of carbohydrate and proteïn metabolism, oxaluria and phosphaturia by Neuberg; cancer by Schmidt; diseases of skin by Salomon and v. Noorden; children's diseases by Czerny and Steinitz; mineral waters and metabolism by v. Noorden and Dapper; bath and metabolism by Matthes; ductless glands by Magnus-Levy; influence of drugs and poisons on metabolism by Loewy; light and metabolism by Salomon; nervous diseases, bone diseases, diabetes insipidus by Mohr.

The last pages are devoted to tables containing the chemical composition and caloric value of practically all the foodstuffs. This is of great assistance to anyone who desires to get information about the composition of a special diet and its value as a food.

Of remarkable interest and well written are the chapters on diabetes, the ductless glands and childrens' diseases. The names of the authors connected with these titles are too well known in the field of original work to leave any doubts of the value of these articles. The facts are brought together in a way that renders reading fascinating.

There is, however, one objection that may be made to this system. It is well known by everyone working in metabolism that there exists in this particular literature an immense amount of what might be termed pseudo-scientific research. Work is done with no regard as to the accuracy of the methods used and conclusions are drawn prematurely.

This system does not sift out enough the reliable data from the doubtful ones, and for this latter reason the beginner in metabolism work will not find the absolute truth of the standing in this field. At the same time we will not omit to emphasize the importance of this book in bringing together practically all the available literature. It is now considerably simpler for a practitioner or anybody else interested in this subject to find a revise of the vast amount of work.

In conclusion we wish only to congratulate the authors for this very admirable system, which can be recommended warmly.

Progressive Medicine. Vol. II. (*Philadelphia and New York: Lea & Febiger, 1908.*)

In this volume hernia is treated by Coley; surgery of the abdomen, exclusive of hernia, by Foote; gynæcology by Clark; diseases of the blood, diathetic and metabolic diseases, diseases of the spleen, thyroid gland and lymphatic system by Stengel; and ophthalmology by Jackson. There is also an index. The reviews of the literature on these subjects are well handled, and the authors succeed in giving a satisfactory résumé of the most recent progress in the history of these diseases. Many of the illustrations are, however, quite worthless, and more attention should be paid to this point by the editors. R. N.

Diseases of the Nose. By Ernest B. Waggett, M. A., M. B. B. C. (Cantab.), Surgeon to the Throat and Ear Department of the Charing Cross Hospital; Surgeon London Throat Hospital, and Throat and Ear Department, Great Northern Hospital. Cloth. 282 pages, with illustrations. Price, $2.00. (*London: Oxford University Press, 1907.*)

In a very condensed way the author gives his views of the present practice of diseases of the nose and throat. This work has much to recommend it to one who desires in short compass the present status of nasal diseases. In his preface the author points out that the book is written to aid general practitioners in their daily work. He emphasizes the value of a proper appreciation of these diseases in clearing up certain obscure cases. Thus "he may cure the subject of chronic bronchitis of twenty years' standing, by draining an antrum, or an able man condemned to "pulmonary tuberculosis," by removing a bleeding polypus. A large proportion of his cases of nerves, of deafness, of bronchitis, of gastritis, and of mere want of development of body or mind are nose cases and they cannot be neglected."

The book is attractively printed with numerous explanatory illustrations made by the author. Sylvan Rosenheim.

A Text-Book of Minor Surgery. By Edward Milton Foote, A. M., M. D., Instructor in Surgery, College of Physicians and Surgeons (Columbia University), etc. Illustrated. (*New York and London: D. Appleton & Co., 1908.*)

In reviewing Dr. Edward Milton Foote's text-book on Minor Surgery one is impressed with the systematic and logical arrangement of its contents. There is the same general outline for each chapter supplemented by descriptions of the lesions peculiar to the anatomical division of which it treats.

The book is an intensely practical one. Burns, bruises and sprains—their diagnosis, treatment and prognosis—are described in as much detail as herniæ and fractures of the femur. The chapter on surgical supplies is especially valuable, giving the prices of materials used and the most economical method of purchasing and preparing supplies.

Notwithstanding all its detail the book is interesting and one is constrained to read it through to the end in hopes of finding some useful hints, and he is not disappointed. The excellent plates all through the book add greatly to its value, especially in the chapter on bandaging, in which the many photographs show more clearly than words could describe the essential steps in the application of the more important bandages.

We cannot agree with Dr. Foote throughout in his description of surgical technique, but feel that the most careful attention should be given to asepsis even in minor surgery.

Clinical Lectures and Addresses on Surgery. By C. B. Lockwood, Surgeon to St. Bartholomew's Hospital, London. Second edition. 307 pages. (*London: Oxford University Press, 1907.*)

This little book is made up of fifteen clinical lectures and addresses on surgery, and although the statements made do not in some instances coincide with the ideas at present accepted in this country, the lectures are full of useful information and good common-sense advice. It is surprising to note that chloroform is the anæsthetic of choice in our author's clinic, and he claims much better working results by its use. He lays great stress, and rightly so, on the value of immediate microscopic diagnosis of tumors during the course of operations, and cites cases in his own experience where such a diagnosis has been of vital importance to the patient. The sections on the Introduction to the Study of Clinical Surgery and on Clinical Reasoning would be of value to every student, and the entire series of lectures are interesting and well worth reading. J. S. D.

Why Worry? By George Lincoln Walton, M. D., Consulting Neurologist to the Massachusetts General Hospital. (*Philadelphia and London: J. B. Lippincott Company, 1908.*)

As a necessary result of the modern (?) ideas about patients suffering from neurasthenia, psychasthenia and other mental troubles, numerous works have appeared in the last two or three years dealing with the treatment of these conditions. Many have been written for the benefit of the public, and the volume before us is the latest one of the series, and one of the best. There are few of us who don't worry about little matters of no importance, and the worry reduces many of us to a pitiful state of nervous irritability and instability. The author shows clearly how harmful worry is and how easily it may be avoided, and "Why Worry" will prove of real help to many, if they will only try to follow the wise advice given. R. N.

BOOKS RECEIVED.

The Diseases of Children. Edited by Dr. M. Pfaundler and Dr. A. Schlossmann. English translation edited by Henry L. K. Shaw, M. D., and Linnaeus La Fétra, M. D. With an introduction by L. Emmett Holt, M. D. In four volumes. Illustrated in black and white and in colors by 61 full-page plates and 430 text cuts. 1908. 4to. J. B. Lippincott Company, Philadelphia and London.

Scientific Memoirs (New Series), No. 31. By Officers of the Medical and Sanitary Departments of the Government of India. *The Development of the Leishman-Donovan Parasite in Cimex Rotundatus. Second report.* By Captain W. S. Patton, M. B., I. M. S. 1908. 4to. 25 pages. Superintendent of Government Printing, Calcutta, India.

Righthandedness and Lefthandedness. With Chapters Treating of the Writing Posture, the Rule of the Road, etc. By George M. Gould, M. D. 1908. 12mo. 210 pages. J. B. Lippincott Company, Philadelphia and London.

Green's Encyclopedia and Dictionary of Medicine and Surgery. Volume IV, Gum-Resins to Intussusception. Volume V, Inulin to Lumbar-Puncture. 1907. 4to. W. T. Keener & Co., Chicago.

Why Worry? By George Lincoln Walton, M. D. 1908. 12mo. 275 pages. J. B. Lippincott Company, Philadelphia and New York.

The Harvey Lectures. Delivered under the auspices of the Harvey Society of New York. 1906-1907. By Prof. A. E. Wright, Prof. C. A. Herter, Prof. W. T. Porter, Prof. J. G. Adami, Dr. S. J. Meltzer, Prof. F. G. Benedict, Prof. E. B. Wilson, Prof. George S. Huntington, Prof. W. T. Councilman and Prof. Friedrich Müller. 1908. 8vo. 314 pages. J. B. Lippincott Company, Philadelphia and London.

Adenomyoma of the Uterus. By Thomas Stephen Cullen, Associate Professor of Gynæcology in the Johns Hopkins University, etc. Illustrated by Hermann Becker and August Horn. 1908. 4to. 270 pages. W. B. Saunders Company, Philadelphia and London.

Insomnia and Nerve Strain. By Henry S. Upson, M. D. With Skiagraphic Illustrations. 1908. 12mo. 142 pages. G. P. Putnam's Sons, New York and London.

Diseases of the Nose, Throat and Ear. Medical and Surgical. By William Lincoln Ballenger, M. D. Illustrated with 471 engravings and 16 plates. 1908. 8vo. 905 pages. Lea & Febiger, Philadelphia and New York.

Progressive Medicine. A Quarterly Digest of Advances, Discoveries and Improvements in the Medical and Surgical Sciences. Edited by Hobart Amory Hare, M. D., assisted by H. R. M. Landis, M. D. Volume II. June, 1908. 8vo. 352 pages. Lea & Febiger, Philadelphia and New York.

Diseases of the Nervous System. By H. Campbell Thomson, M. D. (Lond.), F. R. C. P. With 8 colored and 12 black-and-white plates, and 101 figures in the text. 1908. 12mo. 480 pages. W. T. Keener & Co., Chicago.

Electrical Treatment. By Wilfred Harris, M. D., F. R. C. P. Illustrated. 1908. 12mo. 383 pages. W. T. Keener & Co., Chicago.

A Text-Book of Surgical Anatomy. By William Francis Campbell, M. D. With 319 original illustrations. 1908. 8vo. 675 pages. W. B. Saunders Company, Philadelphia and London.

Bier's Hyperemic Treatment. In Surgery, Medicine and the Specialties. A Manual of its Practical Application. By Willy Meyer, M. D., and Professor Dr. Victor Schmeiden. Illustrated. 1908. 8vo. 209 pages. W. B. Saunders Company, Philadelphia and London.

A Manual of the Diseases of Infants and Children. By John Ruhräh, M. D. Second edition, thoroughly revised. 1908. 12mo. 423 pages. W. B. Saunders Company, Philadelphia and London.

State Board Questions and Answers. By P. Max Goepp, M. D. 1908. 8vo. 684 pages. W. B. Saunders Company, Philadelphia and London.

Pharmacology. The Action and Uses of Drugs. By Maurice Vejux Tyrode, M. D. 1908. 8vo. 255 pages. P. Blackiston's Son & Co., Philadelphia.

Meat and Food Inspection. By William Robertson, M. D., D. P. H. F. P. S. With *Regulations Governing Meat Inspection in the United States.* By Maximilian Herzog, M. D. 1908. 8vo. 388 pages. W. T. Keener & Co., Chicago.

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CONTENTS.

PAGE

The Pro-Infective ("Aggressive") Action of Normal Blood-Serum. By Rufus I. Cole, M. D., and M. R. Smirnow, M. D. . . . 249

Acute and Chronic Gastro-Mesenteric Ileus, with Cure in a Chronic Case by Duodeno-Jejunostomy. By Albert L. Stavely, M. D. 252

The Statistics of Tuberculous Peritonitis from the Clinical Records of the Johns Hopkins Hospital. By Louis Hamman, M. D. 256

Therapeutic Note on the Action of Lecithin in Exophthalmic Goiter. By Henry J. Berkley, M. D., D. Sc. 259

Amboceptors and Complement in Typhoid Sera. (Illustrated.) By Henry S. Denison, M. D. 263

PAGE

The Hæmolytic Action of Bile and its Inhibition by Blood-Serum. By Andrew W. Sellards. 268

The Effect of Heated Serum on Rouleaux Formation of Red-Blood Corpuscles. By Andrew W. Sellards. 271

An Instrument for the Determination of Venous Pressure in Man. (Illustrated.) By D. R. Hooker, M. D., and J. A. E. Eyster, M. D. . . 274

A Family of Hemeralopes. (Illustrated.) By James Bordley, Jr., M. D. 278

Notes and News. 282

Notes on New Books. 282

THE PRO-INFECTIVE ("AGGRESSIVE") ACTION OF NORMAL BLOOD-SERUM.

By Rufus I. Cole, M. D.,

Associate in Medicine, The Johns Hopkins University and Hospital

AND

M. R. Smirnow, M. D.,

New Haven, Conn.

(*From the Biological Division of the Medical Clinical Laboratory, Johns Hopkins Hospital.*)

The extensive study of immunity during the past few years has demonstrated the important rôle which the blood-serum plays in this process. Not only does the serum contain the substances which neutralize poisons produced by certain bacteria, but the work of Flügge, Nuttall, Buchner, and others has shown that normal serum may contain substances directly antagonistic to bacteria, bactericidal or bacteriolytic substances, and that these may be markedly increased by infection or inoculation, and so play an important rôle in immunity. The serum has even been shown to play an important part in that form of immunity spoken of as phagocytic. It has been shown by Denys and Le Clef and others that the presence of serum is favorable, and in certain cases, necessary for the ingestion of bacteria by leucocytes, and Wright has much extended our knowledge of this action of the serum and has ascribed it to certain hypothetical substances in the serum, "opsonins."

All of these actions of the serum are directly antagonistic to infection and the serum therefore has come to be considered one of the most important, if not the most important, constituent of the body for preventing infection or for destroying the infectious agent if it be already present.

It has been shown by Bail and others, however, that, under certain circumstances, serum, or more particularly serum from exudates, may exert an influence directly favoring infection. Bail's method of experimentation is the following: Into the pleural or peritoneal cavity of a rabbit or guinea-pig a fatal dose of the organism in question is inoculated. After the

death of the animal, or after the animal is killed, the exudate which has formed within the pleura or peritoneum is withdrawn and the bacteria and cells present are removed by filtration. This germ-free exudate is found to be harmless (at least in moderate amounts) when injected into animals. If, however, this exudate be added to non-harmful doses of the bacteria in question, or to doses which alone produce only moderate symptoms, and the mixture be injected into animals, it is found that the injected animal dies, while the control animal, which has been injected with the same dose of bacteria alone, lives, or that the injected animal dies more quickly than the control animal, or, lastly, that the symptoms produced are much more severe than those which occur in the control animal.

Bail has interpreted these results as follows: During the course of infection there are produced by the bacteria substances, harmless in themselves, which neutralize or antagonize the natural defenses of the body. These substances are present in the exudates caused by infection and after the bacteria are filtered out these substances remain. Now, when these are injected into the animal, together with bacteria, the defences are paralyzed and a small number of bacteria, which under ordinary circumstances would be overcome by the body, are able to multiply and produce their effects. To these hypothetical substances in the exudate, Bail has given the name "aggressines."

This interpretation, however, has been called in question by Wassermann and others who have maintained that these results are produced not only by filtered exudates, but also by the filtrates of bacteria grown in vitro, not only in serum but in other media as well, and even by the watery extracts of the bacteria. They claim, moreover, that the filtered exudates are not entirely harmless, and that the results obtained are probably due to the added deleterious effect of the serum. In the case of watery extracts, it is thought that it is a question of free receptors which attach the bacterial amboceptors and so render them ineffective.

The weight of evidence at present seems to be against the view of Bail, but whatever the interpretation, it is evident that we are here dealing with serum changed during the course of infection.

From the preceeding it is evident that up to the present our idea of the normal serum in its relation to infection has been that it contains substances and exerts effects antagonistic to infection.

In the course of work relative to immunity to B. pneumoniæ, the writers have observed a phenomenon which seems to show that, under certain conditions, foreign serum, at least, may produce an effect directly favorable to the course of infection, an effect somewhat analogous to the aggressive action described by Bail.

As is well known, pigeons show an astonishing degree of resistance to infection with B. pneumoniæ, it being possible to inject into the peritoneal cavity of a pigeon, without any marked effect, a dose of virulent B. pneumoniæ sufficient to kill many rabbits. Experiments were undertaken to determine, if possible, the nature of this natural immunity and to try to discover whether or not it might depend upon the action of substances contained in the serum. By means of the technique employed in demonstrating the so-called Pfeiffer phenomenon, an effort was made to determine the effect of the combined inoculation of pigeon serum and B. pneumoniæ into the peritoneal cavity of mice. Into mouse A, 1 cc. of emulsion of B. pneumoniæ was injected, and into mouse B, 1 cc. of emulsion + 1 cc. of pigeon serum. After one hour a small amount of exudate was removed by means of a capillary pipette, and this procedure was repeated at intervals for 12 hours. No constant differences could be determined in the two mice, either as concerns the amount or kind of exudate or degree of phagocytosis. This experiment was also repeated using defibrinated pigeon blood instead of pigeon serum, with results as before.

It was then thought that although there was no apparent effect when large amounts of the infectious agent were employed, protection of the mice might be obtained when small doses, minimal lethal doses or slightly larger, were employed, and that the effects might be indicated by the complete protection of the animal against the minimal lethal dose, or at least by its resisting the infection and so living longer than the control animal.

To our great surprise, however, the animals into which the serum was injected simultaneously with the bacteria, instead of being protected, died more quickly than did the animals into which the bacteria were injected alone. This action of the serum we have found to be constant and occurs not only with pigeon serum but rabbit serum as well.

Experiments.

In all experiments the same race of B. pneumoniæ was employed. This was isolated from the sputum of a case of lobar pneumonia and was transferred daily on human blood agar. Its virulence for mice was in this way kept fairly constant, but as the experiments were carried over a considerable period of time they are not directly comparable, one to the other, as the minimal lethal dose varied somewhat. We have also had no method for determining accurately the dose from day to day, though in each experiment equal doses or multiples of the dose could be determined by using emulsions. The standard employed was the growth on one blood-agar tube carefully washed off and emulsified in 0.85 per cent sodium chloride solution, 20 cc. usually being employed for this purpose. It is impossible, however, to have tubes always exactly the same size, and even if they are so, the amounts of growth invariably differ slightly. As regards dosage, 0.5 cc. of the emulsion made by washing one tube in 20 cc. salt solution is spoken of as 1/40 tube. The minimal lethal dose of the race employed was determined from time to time and found to vary between 1/50 and 1/80 tube.

The pigeon and rabbit sera were obtained under aseptic precautions and the blood allowed to clot in sterile tubes and centrifugalized within a short time, so that in all cases the serum was used within 1 to 2 hours after removal from the body. Where the mixtures of bacterial emulsion and serum

were injected together, the mixture was made in the syringe immediately before injection.

In each experiment the mice employed were of as nearly the same size and weight as possible.

EXPERIMENT I, May 8, 1908.

Mouse A. Intraperitoneal inoculation of 1/40 tube B. pneumoniæ.

Animal appeared quite sick for two days, then seemed somewhat better, but died on the morning of the sixth day.

Mouse B. Intraperitoneal inoculation of 1/40 tube B. pneumoniæ + 1.25 cc. pigeon serum.

Animal appeared sick for two days and died on morning of third day.

Mouse C. Intraperitoneal inoculation of 1/40 tube B. pneumoniæ + 1.25 cc. pigeon serum.

Animal found dead on morning of third day.

EXPERIMENT II, May 19, 1908.

Mouse A. Intraperitoneal inoculation of 1/30 tube B. pneumoniæ.

Death on fourth day.

Mouse B. Intraperitoneal inoculation of 1/30 tube B. pneumoniæ + 1 cc. 0.85 per cent NaCl solution.

Death at end of fourth day.

Mouse C. Intraperitoneal inoculation of 1/30 tube B. pneumoniæ.

Death on fourth day.

Mouse D. Intraperitoneal inoculation of 1/30 tube B. pneumoniæ + 1 cc. pigeon serum.

Death on third day.

Mouse E. Intraperitoneal inoculation of 1/30 tube B. pneumoniæ + 1 cc. rabbit serum.

Death on morning of third day.

EXPERIMENT III, June 1, 1908.

Mouse A. Intraperitoneal inoculation of 1/20 tube B. pneumoniæ.

Death on fourth day.

Mouse B. Intraperitoneal inoculation of 1/20 tube B. pneumoniæ + 0.75 cc. rabbit serum.

Death on second day.

Mouse C. Intraperitoneal inoculation of 1/20 tube B. pneumoniæ + 0.5 cc. pigeon serum.

Death on third day.

EXPERIMENT IV, June 19, 1908.

Mouse A. Intraperitoneal inoculation of 1/20 tube B. pneumoniæ + 0.5 cc. 0.85 per cent NaCl solution.

Death on third day.

Mouse B. Intraperitoneal inoculation of 1/20 tube B. pneumoniæ + 0.5 cc. rabbit serum.

Death in seventeen hours.

Mouse C. Intraperitoneal inoculation of 1/20 tube B. pneumoniæ + 0.5 cc. pigeon serum.

Death in twenty-four hours.

EXPERIMENT V, June 19, 1908.

Mouse A. Intraperitoneal inoculation of 1/20 tube B. pneumoniæ + 0.5 cc. 0.85 per cent NaCl solution.

Death at end of third day.

Mouse B. Intraperitoneal inoculation of 1/20 tube B. pneumoniæ + 0.5 cc. rabbit serum.

Death in thirty hours.

Mouse C. Intraperitoneal inoculation of 1/20 tube B. pneumoniæ + 0.5 cc. pigeon serum.

Found dead on morning of fourth day.

EXPERIMENT VI, June 24, 1908.

Mouse A. Intraperitoneal inoculation of 1/20 tube B. pneumoniæ + 0.5 cc. 0.85 per cent NaCl solution.

Death on fourth day.

Mouse B. Intraperitoneal inoculation of 1/20 tube B. pneumoniæ + 0.5 cc. rabbit serum.

Death on second day.

Mouse C. Intraperitoneal inoculation of 1/20 tube B. pneumoniæ + 0.5 cc. pigeon serum.

Death on third day.

EXPERIMENT VII, June 24, 1908. (Mice larger than in Experiment VI.)

Mouse A. Intraperitoneal inoculation of 1/20 tube B. pneumoniæ + 0.5 cc. 0.85 per cent NaCl solution.

Death on fifth day.

Mouse B. Intraperitoneal inoculation of 1/20 tube B. pneumoniæ + 0.5 cc. rabbit serum.

Death on third day.

Mouse C. Intraperitoneal inoculation of 1/20 tube B. pneumoniæ + 0.5 cc. pigeon serum.

Death on second day.

Autopsies were performed on all mice. B. pneumoniæ were cultivated from the peritoneal cavities, heart's blood and organs in all cases. Usually these were in pure culture. Where other organisms were also obtained they were manifestly due to contamination at the autopsy.

No constant differences in pathological findings were obtained. The amount of exudate in the mice into which serum had been injected was as a rule less than where the bacteria were injected alone, but this was not striking or constant enough for stress to be laid upon it.

Results.—While the results are not striking, they have been almost constant. Not only has the simultaneous injection of serum not protected the animals, but in all experiments, but one, the animals into which serum was injected died more quickly than those which were injected with the bacteria alone. In the only experiment showing an exception (V), the mouse C, into which pigeon serum was injected, lived slightly longer than the control A, though on the third day it appeared more sick than A. The mouse B, into which rabbit serum was injected, died much sooner than the control. No explanation could be found for this exception.

We have not succeeded in rendering an otherwise non-fatal dose, fatal by the addition of serum, but the difficulties are rendered greater by the great susceptibility of mice to B. pneumoniæ. The results, however, are as striking as have been obtained in most of the experiments of Bail and others showing the aggressive action of exudates.

Interpretation.—We are dealing here with a phenomenon which seems to show that blood-serum may exhibit an effect directly contrary to what we have considered the usual one. Instead of killing the bacteria or, at least, rendering them harmless, or of neutralizing their poisons, foreign serum when injected into an animal may increase its susceptibility or may render the bacteria, simultaneously injected, more virulent. Until we know more of the nature of B. pneumoniæ infection and immunity it is impossible to say just how this action is brought about.

It is conceivable that when a foreign serum is brought into the peritoneal cavity precipitines are formed which carry down the bactericidal complement, or that amboceptors are present in the animal body for certain antigens in the serum, and that when these are brought together there occurs union and absorption of the bactericidal complement, which is thus diverted from the bactericidal amboceptors. Since, however, it has so far been very difficult or impossible to demonstrate any bactericidal action of serum for B. pneumoniæ in vitro, such a view is purely theoretical.

On the other hand, it is well known that foreign sera and foreign proteids may have a toxic effect when injected into animals. Under ordinary conditions, however, this effect is not very great in the case of serum, unless very large doses be injected, or unless the animal has been previously rendered hypersensitive, or reduced to a state of anaphylaxis, by the previous injection of a small amount of serum at a proper interval. In this case there can be no question of anaphylaxis, as the animals were fresh ones, in many cases only brought into the laboratory on the day that the experiments were carried out. That the pigeon or rabbit serum may have had slight toxic effects on the mice, however, is possible, though the injection of larger doses of the serum alone than were employed in the experiments had no apparent deleterious effects. We have found by experiment that 1 cc. of pigeon or rabbit serum injected into a mouse has absolutely no ill effects that can be detected.

Lastly it must be questioned whether the results obtained by Bail and others with so-called "natural aggressines" may not have been due in part, at least, to the injection of serum together with the bacterial cultures, and not to any specific substances contained in the exudate. This possibility does not seem to have been sufficiently kept in mind by Bail and his followers.

As regards the writers' experiments, we can only offer them as an individual case. Whether further studies will show that this is not an isolated instance of the infection favoring action of foreign blood-serum, we cannot state. However, it is here demonstrated that under certain conditions blood-serum, even of naturally immune animals, may not only not produce passive immunity in naturally susceptible animals, but may favor their infection.

ACUTE AND CHRONIC GASTRO-MESENTERIC ILEUS, WITH CURE IN A CHRONIC CASE BY DUODENO-JEJUNOSTOMY.

By Albert L. Stavely, M. D.,

Visiting Gynæcologist to the Garfield Memorial Hospital, Washington, D. C.; Former Resident Gynæcologist at the Johns Hopkins Hospital.

While gastro-mesenteric ileus was known to Rokitansky years ago it was not until Fagge reported his cases in the "Guy's Hospital Reports" of 1872 and 1873 that the condition was fully described and appreciated as a clinical entity. H. Campbell Thompson in 1902 discussed the subject exhaustively and stimulated renewed interest in it. Still later the reports of Finney, followed by those of Bloodgood, have so kept the matter before our attention that every surgeon is on the lookout and many lives are now saved through its early recognition.

The acute form has been carefully considered; but the chronic has been overlooked and I believe in this latter field investigations will reveal conditions which have been misunderstood, and symptoms which have been assigned to indigestion, to gastroptosis, and to dilatation of the stomach, or the result of disturbance of its motor functions, will be found to be due in a fair percentage of cases to a constriction of the small intestine by the mesenteric ligament, and studies will show that where the symptoms are persistent and severe, there is every reason to have confidence in the efficacy of operative procedure, a duodeno-jejunostomy. The obstruction is due to traction on the mesenteric ligament and the superior mesenteric artery, which press against the small intestines at the duodeno-jejunal junction. The conditions found on operating are uniform. The stomach is dilated, the greater curvature being much lower than normal and the lesser usually sharply bent as a result of the distension. The duodenum, also much distended, is carried up close to the liver and forms a big U-shaped curve, with its lower termination at the mesenteric ligament. That the distension does not always end here has been attested to by those who have observed it to cease before it reached that point, and others, who have seen it extend beyond. In some of these cases dilatation of the cæcum and the ascending colon has been noted.

The query might arise, Are these peculiarities of gastro-mesenteric ileus, or are they the result of faulty observation? The suggestion has been made that the condition is due to disturbed innervation of a certain portion of the small bowel. There is considerable difference of opinion as to its causation. Recently attention has been called to it on account of its occurrence after operations. While it has been more particularly noted after abdominal operations, it is by no means confined to them. In a table compiled by H. Campbell Thompson, of 44 cases mentioned, 12 followed operations and 4 of these were abdominal. Three out of the last 4 referred to had gall-bladder or gall-duct disease. This seems to bear out a statement of Robson as to its frequent association with gall-bladder inflammations, but the possibility of gauze packing or peritonitis must not be lost sight of as the cause of the nausea and vomiting. The other 8 cases mentioned by Thompson followed operation on the kidney, ankle, knee, foot, breast; so the nature of the operation has no defi-

nite bearing on its development. It follows the administration of chloroform more often than that of other anesthetics, and this is considered a positive etiological factor. Patients with relaxed abdominal walls are predisposed, as are those with prolapsed uteri and large herniæ. It accompanies or follows both acute and chronic wasting diseases. It may develop as a result of profound nutritional, nervous or toxic influences, affecting the stomach. These statements would sustain the theory held by Thompson, Box, and Wallace, who consider paralysis of the stomach as the primary cause. Then comes the distension with gas and fluids. The distended stomach presses the duodenum down and against the spine and causes the obstruction. Müller believes the chief cause to be the dorsal recumbent position, aided by the debilitating effect of the anesthetic and the purging, which empties the bowels and allows them to gravitate into the pelvis. Fagge and Morris attach more importance to the over-distension from gastric secretions. Another view is that the ileus is secondary to a rapidly developing atrophy of the stomach and duodenum. Byron Robinson considers enteroptosis an important factor. This relation is mentioned by Glenard. Another cause is excessive eating. A man who was very much exhausted, from tramping around the country without food, ate a large meal, was seized with nausea and vomiting and died in two days. It also follows acute surgical injuries. Whatever theory may be correct, the traction of the prolapsed small intestines upon the mesenteric ligament with the resulting obstruction at the duodeno-jejunal junction is a positive. if not a primary cause.

Acute gastro-mesenteric ileus may exist without marked symptoms and there is little doubt that many unsuspected cases of moderate dilatation have been recovered from. There may be in the beginning nothing to indicate the severe condition which is imminent. After an operation nausea and vomiting may exist and pain more or less severe may develop. While general abdominal pains sometimes are present, they are generally confined to the epigastric region. After a time, it may be in a few hours or after a few days, the pain lessens and the character of the vomitus changes. Instead of the ordinary ejections of an irritated stomach there are discharged by regurgitation rather than by active vomiting large quantities of dark green or brown fluid. The intervals depend upon the degree of paralysis. When the stomach is much dilated they may be several hours apart. The amount of fluid ejected may be enormous. It is common to have as much as three or four pints expelled at one time. With the establishment of complete paralysis the patient feels easier, the pain may cease and aside from the prostration and great thirst he complains of very little. With the persistence of the condition the face becomes pinched and anxious, the weakness extreme, the thirst intense, the pulse rapid, the respirations quick and shallow and the temperature remains nearly normal, or is subnormal. The urine becomes scanty and toward the end the action of the kidneys may be entirely suspended. Clay-colored stools may exist from the absence of bile. Death from collapse finally ends the scene within two or three days from the onset of the trouble. Exceptionally death may occur within one day or after a week.

In chronic cases the symptoms are less pronounced. The obstruction is less complete and a certain amount of food is retained and assimilated. In slight degrees of distension there may be little to attract attention to the actual condition. A variable amount of distension of the stomach, pain or discomfort, especially after eating, nausea and vomiting are the symptoms. The patients are usually constipated. In more marked cases the stomach may distend suddenly like a balloon after taking food, the pain becomes intense and the nausea and vomiting extreme. The vomiting is unlike that in the acute form. There is none of the bulky regurgitation. The physical signs are enlargement in the epigastric and left hypochondriac regions, extending sometimes as far as the pubes. There may be resonance or dulness, according as to whether the stomach is filled with gas or fluid. If both are present, a splashing sound may be elicited. If only fluid exists, fluctuation can be detected. This was so apparent in one case that the surgeon ran in an aspirating needle and drew off two drams of thick greenish fluid with a queer odor. Thinking he had a pancreatic cyst, he opened the abdomen and let out three pints of fluid and stitched the walls of the supposed cyst to the skin. The man died shortly after the operation. The abdomen, outside the stomach area, may be retracted. Except in very thin subjects, where the distension is confined to the stomach and duodenum, it would be difficult to detect any fulness of the duodenum.

The difficulties in the way of diagnosis are rapidly disappearing under a more exact knowledge of the condition. Acute cases must be differentiated from a high obstruction of the small intestine, from acute ileus in other parts and from septic peritonitis. It is a most difficult matter to decide between an acute gastro-mesenteric ileus and a high obstruction of the small intestine. The therapeutic test of washing out the stomach and changing the position of the patient may clear up the situation. The former condition is frequently relieved by these measures; the latter, never. Bloodgood, while admitting the extreme difficulty of the differentiation, thinks there are some points of difference. He says: "In high intestinal obstruction initial pain, accompanied perhaps by peritoneal shock, which may later sometimes disappear, and vomiting without marked distension are the symptoms, which differentiate it from acute distension. In the latter the initial pain is absent; the patient suffers from epigastric distress, the collapse is gradual and progressive; the most characteristic symptom is the abdominal distension, beginning in the epigastrium and in some cases extending to the pubes. The distension is immediately relieved by the passage of the stomach tube. In high intestinal obstruction, in my experience, epigastric distension is a very late symptom, and so far in my cases at operation great dilatation of the stomach and duodenum has not been found." In obstructions, due to bands, kinks or twists, there is not so much difficulty in diagnosis. There is at the seat of the obstruction an intermittent griping pain and in thin abdominal walls the peristaltic contractions, which cause

the pains, can be plainly seen. The distension may be partial or general, depending upon the location of the ileus. Nausea and vomiting are severe, according to the completeness of the obstruction. At first the vomitus may contain food and mucus, later bile and finally stercoraceous matter.

In gastro-mesenteric ileus there is the absence of colic. At first there may be a constant pain in the epigastric region; but this, on the other hand, may be more generally distributed. In uncomplicated cases the distension may be entirely local. The vomiting in the beginning is not characteristic, but later, when the voluminous ejecta occur, it is strongly suggestive.

In septic peritonitis there may be a chill and a rise of temperature. There may be paroxysms, indicating the presence of an ileus or general distension, resulting from intestinal paresis. The vomiting is quite persistent.

Chronic gastro-mesenteric ileus must be distinguished from dilatation of the stomach, due to other causes, from gastroptosis and from incomplete ileus of high origin. Dilatation of the stomach, alone, is due to obstruction in that organ, or at the pylorus, or to interference with its motor functions. There is no distension of the duodenum. The symptoms are not relieved by position. The vomiting may be different. In dilatation of the stomach, where vomiting occurs, it may come at infrequent intervals. The patient may retain everything for three or four days and then, when the burden becomes excessive, the contents are poured out in a foul inundation. Unlike the vomiting of gastro-mesenteric ileus, it is dark gray in color and contains quantities of decomposing food and has a bad odor. In the gastroptosis of Glenard's disease the stomach is drawn down to such an extent that the pylorus is compressed or kinked and the passage of food interfered with. It is believed the ptosis begins at the hepatic flexure of the colon; the stomach is then drawn down and, later, the rest of the transverse colon. Glenard thinks a narrowing at the duodeno-jejunal junction sometimes occurs. This would indicate the occasional co-existence of gastro-mesenteric ileus with Glenard's disease. The association of gastroptosis with displacement of the kidneys and other organs will assist in the differentiation. Incomplete ileus of high origin would be difficult to distinguish from the chronic gastro-mesenteric type. Position, recommended for the relief of gastro-mesenteric ileus, might help in removing doubt. The prognosis has been considered very bad. Until recently the condition has not been well understood and symptoms we now recognize as belonging to gastro-mesenteric ileus were given another interpretation. With a thorough appreciation of the etiology and a prompt resort to proper treatment it is reasonable to expect recovery in the majority of uncomplicated cases.

The treatment is washing out the stomach and continuing this at intervals, until the symptoms are relieved. At the same time it is important to try the effect of position. Place the patient on the right side and elevate the foot of the bed at least three feet. The knee-chest position is recommended for intractable cases. In addition to the knee-chest position Binswanger recommends the use of bimanual taxis of the small intestines, using one hand in the rectum or vagina and the other over the abdomen. Albrecht[1] advises strongly in favor of washing out the stomach and placing the patient on the abdomen. If this fails, change the position to the knee-chest, alternating with the prone. He says the effects of the prone position are most striking. The vomiting ceases almost immediately, gas passes, the bowels move and the patient shows a marked general improvement. The explanation of the relief afforded by the prone position may be accounted for in two ways, the relaxation on the mesenteric ligament, which allows gas and fluid to pass the point of constriction and the ease with which they afterwards pass through the intestines beyond the constriction.[2] Referring to the rapid pulse, which he has noticed after the relief of acute dilatation of the stomach, he thinks it is due to an inhibition of the sympathetic nerve. To prevent acute dilatation he advises restriction of fluids and, where operations are prolonged, spinal instead of general anesthesia and suggests fixation of the flexure. Strychnia should be tried. Abdominal pads, although advised, could be of no use.

Whether operative measures will find a place in acute cases remains to be determined. Usually the patient is in desperate straights. If other treatment fails, it would seem proper to do something, even if it be only a gastrostomy. If the theory of gastric pressure is correct, this measure ought to be of service. A prolonged operation is out of the question and the result would depend upon the skill and rapidity of the operator.

In chronic cases the situation is different. No medication nor local treatment will relieve. An operation is the only means to effect a cure. The choice rests between a gastro-enterostomy and a duodeno-jejunostomy. The former procedure has been advised in the acute form as a last resort and has resulted favorably in two or three cases. Byron Robinson has recommended, but has not made a section of the small intestine at the duodeno-jejunal junction, bringing the two incised ends in advance of the ligament and making an end to end anastomosis. This does not seem very practical. The operation for chronic cases, which appeals to me and which has been suggested, but not performed, by Bloodgood, is a duodeno-jejunostomy. The advantages over a gastro-enterostomy are evident. In the latter there is the possibility of regurgitation of pancreatic juice and bile into the stomach, and thus the establishment of a vicious circle. In duodeno-jejunostomy these fluids are deflected only slightly from their normal course and the danger of a vicious circle is avoided.

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[1] Monatsschr. f. Geburtsh. u. Gynaek., XXVI, No. 5, p. 645.

[2] Monks, of Boston, in experimenting upon the small intestines in the cadaver, found, when they were nailed on a board by the mesentery placed in a vertical direction, there was great difficulty in getting the fluids to pass on account of kinking. Edward M. Parker, of Washington, experimenting along the same lines, found that by suspending the intestines by the mesentery and running water through them from a hose, it passed not only without obstruction, but with great rapidity, the coils straightening out as soon as the water entered. This may be known to those who engage in post-mortem work. In this way we can explain the benefit afforded by placing the patient in the prone position.

The following is the report of a case of acute gastro-mesenteric ileus, following operation for appendicitis, inguinal hernia and varicocele:

A man, age 30, had chronic appendicitis for several years and from early childhood had worn a double truss for hernia of both sides. The left hernia had been cured by the constant wearing of the truss, but had left a marked varicocele. The anesthetic chosen was ether; but a change was made to chloroform because the former acted badly. The anesthetic was continued for over an hour, at the end of which time his condition was excellent. During the afternoon he had marked nausea and at short intervals vomited small quantities of frothy fluid. This continued throughout the night and the following day. Pain in the abdomen was intense from the beginning; many injections of morphia were required, and these gave little relief. The pain, while most marked over the upper part of the abdomen, was quite well distributed. At no time was the abdomen distended; but there was later a slight fullness in the epigastric region. On the third day there came a change. The vomiting occurred less frequently and was attended by no retching. There was at intervals of every two or three hours a regurgitation of several ounces, sometimes as much as two or three pints, of a thin greenish-black fluid. The pain had ceased absolutely and the patient expressed himself as feeling very comfortable, but was very weak and thirsty. He began to look ill. The following day conditions remained the same, and I wished to wash out the stomach; but objection was made and the step was deferred. In the evening an enema was given, and this relieved him of considerable gas. At the same time he vomited. I saw him that evening and ordered the nurse to turn him on his right side and elevate the foot of the bed, and left instructions to wash out his stomach, if relief was not obtained. From the moment the change of position was tried the symptoms completely vanished and he made a rapid convalescence. At no time did the pulse or temperature exceed 100.

The only case of chronic gastro-mesenteric ileus I know of, besides the one of my experience, is that of Bloodgood.

His patient was a white married woman, 42 years of age. Two years before she had mumps, and during her convalescence she suffered from abdominal pain and nausea, and this persisted intermittently up to the time of her death. During the last year she had five acute attacks, which consisted of pain in the left side of the abdomen, with nausea and vomiting. They lasted about three days and were relieved by calomel. In the intervals she suffered with indigestion and belching. She was thin and nervous. Abdominal signs were wanting, excepting epigastric resistance and an indistinct mass situated between the navel and the right costal margin. At the exploratory operation, a moderate dilatation of the stomach was found. The duodenum was high up under the liver, distended and U-shaped and surrounded the pancreas, which was hard. The two were unusually movable. The duodenum was soft and compressible. The intestines were small and contracted, and there was a marked contrast in the size of the jejunum and the neighboring duodenum. As the condition was an unfamilar one he closed the wound. He had considered posterior gastro-enterostomy, but the operation did not appeal to him very strongly. After operation there seemed to be a slight improvement. He finally decided upon a gastro-enterostomy, but the patient died suddenly before he had the opportunity to operate, five weeks after the exploratory operation.

Author's case. Chronic gastro-mesenteric ileus. Operation, duodeno-jejunostomy.

Mrs. F., white, married, age 36, a woman of spare physique. The family history has no bearing. She had measles as a child and whooping cough three years ago. Menstruation began at eighteen. She has had two children, both living and well. The last conception seven years ago resulted in a miscarriage. Infection followed and a pelvic abscess formed. Vaginal puncture was made at the Providence Hospital. For five days following the operation there was at frequent intervals vomiting of large quantities of dark green fluid. Her life was despaired of. Something, she does not remember what, brought about a happy change and she recovered; but her recovery inaugurated a complex of symptoms which had not existed prior to that time and which continued up to the time of the final operation. These were marked distension of the stomach, pain, generally severe, located in the stomach and extending to the lateral portions of the abdomen, nausea and vomiting. The vomiting was frequent, but not invariably present. These attacks always followed the taking of food. No matter how digestible the latter, symptoms were always present; but very small quantities of broth gave the least discomfort. Milk had a bad effect. She has been obstinately constipated. The distension occurred with remarkable rapidity, almost immediately after the taking of food, was limited to the stomach area and was always present, varying somewhat in the amount of tension. An attack would often last several hours and could only be relieved by drinking hot water and vomiting. Turpentine stupes modified the pain. The vomitus was always green and bitter. Occasionally she had vertical headaches and severe pains in the shoulders and arms. These pains she attributed to the condition of her stomach. During the seven years the symptoms persisted she had, as well as she could remember, about twenty attacks, during which the stomach became so distended that she lost consciousness. I saw her in the summer of 1907, with Dr. John Shaw, and, without recognizing the exact condition, advised an operation. She went to the Garfield Hospital, where a duodeno-jejunostomy was performed on December 16, 1907. At that time the stomach was much distended. There was a dome-shaped projection, which occupied the epigastric region and extended an inch or so below the navel. A central incision was made. The stomach was distended with gas and the duodenum, about three inches in diameter throughout its entire length, extended well up under the liver and described a large U-shaped curve. The distension extended to the mesenteric ligament. The jejunum, while containing some gas, was soft and compressible and in no way resembled the duodenum. The pylorus would easily admit four fingers. Upon raising the transverse colon the bulging of the duodenum could be seen against the gastro-colic omentum. Below, the small intestines were contracted. The constricting cause was unmistakable and I decided upon anastomosing the duodenum and jejunum in front of the mesenteric ligament. This was rendered more easy on account of the large size of the duodenum. An opening was made from below, through the gastro-colic omentum, a part of the duodenum drawn through and anastomosed to the jejunum about a foot from its origin. The edges of the omental opening were stitched. After the operation she vomited almost constantly until the following morning; after that there was a gradual improvement and all irritation ceased about five o'clock the same afternoon. For the first thirty hours she was given salt solution by the rectum, and after that water by the mouth. On the third day she was allowed albumen water and broths, and these were continued for ten more days with little variation, when the button passed. After that she ate eggs, toast, tender beef and other articles without discomfort. The results of the operation have been most satisfactory. At the present time, six months after the operation, she is entirely free from gastric distension and pain, can eat any kind of food without discomfort, and has gained about twenty pounds in weight. She can be considered cured.

THE STATISTICS OF TUBERCULOUS PERITONITIS FROM THE CLINICAL RECORDS OF THE JOHNS HOPKINS HOSPITAL.[1]

By Louis Hamman, M. D.,

Associate in Medicine, and Director of the Phipps Dispensary, The Johns Hopkins Hospital.

In 1903, at the request of Doctor Osler, I went over the records of the cases of tuberculous peritonitis that had occurred in the hospital during the first fifteen years of its life, and added a few subsequent histories to make the total number 150. With the permission of Doctor Halsted, Doctor Kelly and Doctor Welch, the surgical, gynecological and pathological records were included in the study, so as to give a well-rounded statistic of the disease. As the table of ages will show, there are unfortunately very few histories of children, an age when the disease is particularly common and its manifestations especially interesting. In the series only those cases have been included in which the diagnosis has been confirmed by operation or autopsy, or in which the clinical picture could leave little doubt about its accuracy. A number of probable cases were omitted.

Of the 150 cases

84 are from the medical division.
48 " " " gynecological division.
18 " " " surgical division.

More than 18 cases appear in the surgical records, but these 18 were admitted directly to the surgical side, whereas the others were transferred from the medical.

Thirteen cases were admitted to the hospital twice and one 6 times.

The ages of the cases are as follows (in two cases it is not stated in the histories):

1 to 10 years,	7	cases.		50 to 60 years,	5	cases.	
10 " 20	"	35	"	60 " 70	"	4	"
20 " 30	"	54	"	70 " 80	"	2	"
30 " 40	"	28	"	80 " 90	"	2	"
40 " 50	"	11	"				

Our figures refer, as was before stated, almost exclusively to adults and give too low a number for children. In 346 cases collected by Doctor Osler, 27 were under 10 years of age. As in other tuberculous lesions, however, the prevalence is most marked in early adult life. Over one-third of the cases occur in the twenties and over a half from the twentieth to the fortieth year. This corresponds with other statistics. Of 164 cases reported by Nothnagel, 87 are in the third and fourth decades; of 218 by Wunderlich 109, and of 346 by Osler 158.

The more frequent occurrence in the colored race is well illustrated. In 147 cases in which the color is stated, 70 are whites and 77 blacks. This is a very much higher percentage for the blacks than is apparent, for the number of white patients admitted to the hospital exceeds largely that of the blacks. Sixty-nine of the patients are males, 81 females; omitting the 48 gynecological cases there are 69 males and 33 females. More men are admitted to the medical and surgical divisions than women, which partly explains the difference. Koenig in his statistics gives, of 131 cases operated upon, 120 women and only 11 men, while of 106 autopsies only 18 were women and 88 men. Such differences are partly explained by the greater frequency of autopsies upon men, but operation is much more common upon women and the results of operation are much more satisfactory.

The family history is of importance chiefly as an index of exposure, but the clinical records frequently lack all mention of this point. Of 131 cases with a satisfactory family history, 39, or 30 per cent, give a history of tuberculous antecedents.

The symptom which first attracted the patient's attention to his illness is of interest. In 146 cases the history is detailed enough to give us this information.

Sixty, or 41 per cent, first noted pain in the abdomen.

Twenty-two, or 15 per cent, came complaining of swelling of the abdomen.

Twenty-seven, or 18 per cent, first noted general constitutional symptoms.

Two cases complained of a lump in the abdomen.

Seven of the gynecological cases entered the hospital on account of menstrual disorders.

Two cases noted first shortness of breath, nine cough, four pain in the side, three diarrhœa, one constipation, two painful micturition, three a feeling of weight in the abdomen, one vomiting.

One case came for a hernia operation and tuberculous peritonitis was diagnosed at operation.

One case was admitted with a tuberculous knee and one case for a severe Pott's disease.

While in most instances the disease came on rather abruptly with well defined symptoms, it is interesting to note in how many it was well advanced before attracting the patient's attention. Twenty-two cases were unconscious of their illness until abdominal swelling was well marked; two sought aid because they felt a tumor; and in a number of cases, particularly among those in the gynæcological division, the condition was not suspected until an operation was performed.

Some of the cases presented more special features of onset:

Four of the cases simulated appendicitis and at least three of these went to operation with this diagnosis.

Two cases simulated gall-bladder disease and one of these, after being seen by Dr. Osler and Dr. Halsted, was operated upon by Dr. Halsted for acute cholecystitis.

Six cases had symptoms of intestinal obstruction. Three of these had symptoms of acute obstruction when admitted to the hospital, and in two the symptoms of obstruction, coming on with great abruptness, were the first evidence of disease.

Three cases were diagnosed ovarian tumor before operation—a repetition of Spencer Wells' classical mistake.

Eighteen cases went to operation with a diagnosis of pyosalpinx.

[1] Read at a meeting of The Lænnec, a Society for the Study of Tuberculosis, Johns Hopkins Hospital, February 7, 1908.

Two cases of special interest were diagnosed carcinoma; one of these was a woman admitted to the medical division complaining of gastro-intestinal symptoms. A large firm mass was discovered in the right iliac fossa and the patient was transferred to the surgical side. At operation there was a large firm tumor mass invading the whole of the cæcum and firmly adherent to the surrounding structures. Inoperable carcinoma was diagnosed, the abdomen sewed up and the patient discharged from the hospital to return home to die. Three years later she was entered again on the medical side, having been well in the interim and having gained markedly in weight.

The diagnosis was then reversed to tuberculous peritonitis. This case no doubt belongs to the interesting group of fibroid tuberculous tumors of the cæcum. The diagnosis of tuberculosis is made with difficulty, even at autopsy. Properly the case should not be classed as tuberculous peritonitis, but I have given it as recorded.

The second case was operated on by the gynecologists and the tubercles thought to be carcinomatous nodules; only a microscopical examination of an excised portion righted the diagnosis. One case was diagnosed cirrhosis of the liver.

Considering how much alike the symptoms are in the two conditions and how frequently the two are associated, the mistake causes no wonder.

In 24 autopsies of persons dying of tuberculous peritonitis, Vierord found both lesions five times, and Friedlander five times in 88 sections. One case followed immediately after trauma to the abdomen. Lücke cites a similar case and gives a full review of the literature. In the case he cites the child had enlarged retroperitoneal glands. One instance followed abortion, one rheumatism, one measles and two pneumonia.

The most important symptoms and clinical findings during the course of the disease are as follows:

One hundred and four cases complained at some time of abdominal pain. This is the most constant and most important of all the symptoms.

Forty-two cases had vomiting and fifty-one nausea.

Forty-eight cases were constipated, thirty-three had diarrhœa and four alternating constipation and diarrhœa.

Six had blood in the stools. In one of these, tubercle bacilli were found in the feces; two more came to autopsy and both showed tuberculous ulcers in the intestine.

Eleven cases complained of pain in the chest: four of these had pleurisy, three pulmonary tuberculosis, three both pleurisy and pulmonary tuberculosis, and one probably pulmonary tuberculosis.

Forty-seven cases had cough: in 34 there was clinically evidence of pulmonary disease; three more of the 47 came to autopsy and all showed pulmonary tuberculosis.

Thirty cases complained of dyspnœa; 24 of these had definite pulmonary lesions.

Less common symptoms are loss of flesh in 61 cases; night sweats in 27; chills in eight, headache in 10; and painful micturition in seven.

Fluid was present in the abdomen in 62 cases, or 42 per cent. In the cases in which the amount of fluid is stated either at operation or autopsy, in 56 cases, there was a large amount in 27, moderate in 15, and small in 14—over four litres being considered a large amount, under one litre a small.

There is no more interesting feature of tuberculous peritonitis than the tumor masses it frequently gives rise to—interesting because they are such stumbling-blocks to diagnosis. Koenig was the first to call attention to their importance and to classify them and Doctor Osler has given them special emphasis in his article in the Johns Hopkins Hospital Reports. Spencer Wells' error was the beginning of the operative treatment. In our series there were palpable abdominal masses in 55 cases, or a little over one-third. The nature of this tumor could be ascertained at operation or autopsy in 43 instances and was:

Matted intestines	8 cases.
Rolled up omentum	9 "
Sacculated fluid	6 "
Enlarged liver	1 "
Enlarged glands	1 "
Pelvic masses discoverable on vaginal examination	18 "

The following abdominal conditions were present on examination:

Tenderness	44 cases.
Rigidity	24 "
Enlarged liver	16 "
Enlarged spleen	3 "

Nine cases showed intestinal peristalsis; four of these had intestinal obstruction.

It is best to divide the clinical complications of tuberculous peritonitis into two groups; (a) the tuberculous complications and (b) the non-tuberculous.

The tuberculous complications which could be made out clinically were:

Pulmonary tuberculosis	25 cases.
Probable pulmonary tuberculosis	10 "
Pleurisy with effusion	21 "
Dry pleurisy	21 "
Probable pleurisy	3 "
Testicular tuberculosis	3 "
Intestinal tuberculosis (tubercle bacilli in stools)	3 "
Probable intestinal tuberculosis (blood in stools)	5 "
Glandular tuberculosis	3 "
Tuberculous pericarditis	2 "

Some of the cases had more than one tuberculous complication: *e. g.*, pulmonary and pleural or intestinal tuberculosis, so that these figures overlap. Of the 84 medical cases there were, however, in 50 (60 per cent), tuberculous lesions elsewhere discoverable clinically.

I wish particularly to emphasize this frequent association as, in obscure abdominal conditions, a pleural rub, râles at an apex, enlarged glands or a nodule in the epididymis may give the diagnosis:

Of non-tubercular complications:

7	had arteriosclerosis.
3	" nephritis.
1	" phlebitis.
1	" gastric ulcer.
4	" marked pigmentation of the skin.

It is customary to make three divisions of tuberculous peritonitis, although the groups are ill-defined and one runs insensibly into the other. The classification is based upon the conditions found at autopsy or operation and it must be remembered that what was an ascitic form may have beeome converted into a fibrous or purulent form before operation or death.

Of 103 cases that were operated upon or came to autopsy:

35 were of the ascitic type.
63 " " " fibrous type.
5 " " " suppurative type.

Wunderlich's figures compiled from 500 operations show a preponderance of the exudative form:

344 were of the ascitic type.
136 " " " fibrous type.
50 " " " supurative type.

In analyzing the blood examinations we have considered only the leucocytes. Counts are given in 65 cases. Of these the counts are:

Under 5,000			8 cases.
Between 5,000	and	10,000	38 "
" 10,000	"	15,000	8 "
" 15,000	"	20,000	8 "
" 20,000	"	30,000	2 "
" 40,000	"	50,000	1 "

In 70 per cent of the cases the count is under 10,000 and in 83 per cent under 15,000. The eleven cases with higher counts had complications. One case with a high count of 42,000 had on admission only 12,000. The patient had general tuberculosis and the high count came shortly before death. Another case where the highest count was 24,000 had a normal count on admission and the gradual but steady rise came on with symptoms of obstruction. Dr. Bloodgood has suggested this as a diagnostic feature.

Of the eight cases with counts between 15,000 and 20,000:

One had intestinal obstruction.
One had pneumothorax with turbid fluid in the pleura.
One had fecal abscesses.
Three had general tuberculosis with pulmonary cavities.

It is apparent that in uncomplicated cases of tuberculous peritonitis there is no leucocytosis. An average of a number of differential counts gives practically normal proportions, *viz.*:

Polymorphonuclear neutrophiles	79 per cent.
Small mononuclears	10 "
Large mononuclears	7 "
Transitions	2 "
Eosinophiles	1.5 "

The temperature in nearly all eases was an irregular one, usually up in the evening and down in the morning, many charts showing a daily variation of 6°. In a few instances the temperature was continuous with only slight daily variation, simulating a typhoid-fever chart and rendering a diagnosis difficult. However, even most of these have the typical up-and-down curve later in the disease. A noteworthy feature of some of the charts is the great length of time during which the temperature was markedly subnormal.

In	5	cases	the temperature never exceeded 99°.					
"	11	"	the highest temperature was between			99°	and	100°
"	23	"	"	"	"	100°	"	101°
"	23	"	"	"	"	101°	"	102°
"	36	"	"	"	"	102°	"	103°
"	28	"	"	"	"	103°	"	104°
"	13	"	"	"	"	104°	"	105°
"	1	"	"	"	"	105°	"	106°

As is seen, in most cases the fever is considerable.

There are records of urine examination in 132 cases:

10 cases had a large amount of albumin.
39 " " a trace.
32 " " albumin and casts.
3 " " a few casts without albumin.

The diazo reaction was performed in 55 cases:

Negative	34 times.
Positive	14 "
Doubtful	7 "

Thirty-five cases of the series came to autopsy:

Eighteen cases showed the lungs definitely involved and in four more there were the remains of old tuberculous lesions.

Twelve cases had an associated peritoneal and pleural tuberculosis and nine more showed pleural adhesions without demonstrable tubercles.

In two cases there was an associated peritoneal and pericardial tuberculosis and in one more an adherent pericardium without demonstrable tubercles.

One case showed tuberculosis of all three serous membranes.

Two cases had adherent pleuræ and pericardium without demonstrable tubercles.

In one case there was peritoneal and pleural tuberculosis with adherent pericardium in which no tubercles were found.

In 27 cases the glands were definitely involved.

In only one case was the peritoneum the sole seat of the tuberculosis in the body, although there was an adherent pericardium.

One case is described as primary intestinal tuberculosis; another as primary in the tubes.

The intestines were involved in 18 cases. There was perforation in six. In 13 of the 18 the lungs were also involved.

These anatomical records bring out several important points:

1. The great rarity of even apparently primary peritoneal tuberculosis. There is only one such case in the series. Münsterman reports only one case in 46 autopsies and Borschke two in 226 autopsies.

2. The great frequency with which more than one serous membrane is affected. In 29 out of our 35 eases there was, besides the peritonitis, an associated pleuritis or pericarditis or both, although in 13 of these no tubercles could be demonstrated in these secondary lesions.

3. One case is of particular interest. A colored boy was admitted six times to the medical division, each time with the diagnosis of tuberculosis of the serous membranes. The peritoneum was first invaded, then the pleuræ, then the pericardium. At autopsy there was an old fibrous peritonitis, pleu-

ritis and pericarditis, but the only definite tuberculous lesion in the body was a small calcareous nodule in the lung. The case belongs to the group of cases called multiple serositis or polyorthomenitis, which group includes the instances described by Curshman as "Zuckergusleber" and by Pick as "pericarditie pseudocirrhosis." Certain of these instances are definitely tuberculous, but in most the tuberculous nature of the lesion is not apparent. Whether or not they are all tuberculous the whole question of their etiology is extremely interesting, but too lengthy to be discussed. Nicols and Kelly both give excellent reviews of the subject.

It remains finally to say a word about the prognosis. The immediate results are as follows:

Discharged from the hospital as well	16	cases.
" improved	71	"
" unimproved	15	"
Died	48	"

This gives an immediate mortality of 32 per cent in all cases. The gynecologists have by far the best record—only five deaths in 48 cases, or 10 per cent.

An effort was made to discover the subsequent results in the patients leaving the hospital. All were written to and those living in the city were personally hunted up and visited. From Dr. Bloodgood I obtained the after-results in a number of the surgical cases. In all 43 cases were heard from. Of these:

14	were reported	dead	33	per cent.
7	"	" living but not well	16	"
22	"	" living and quite well	51	"

Of the 14 cases reported dead:

Three died within three months.
One died within one year.
Three died within two years.
One died after one year from acute intestinal obstruction.
One died after three years from carcinoma.
One died after four years from an operation said to have been for gall-stones.

Of the 7 living but not well:

One was living after 10 years. Feels strong and well but sinus persists.
One was living after six years but has tuberculous glands in the neck.
One was living after six years, has attacks of abdominal pain but is otherwise well.
One was living after six years; writes that she is thin and weak.
One was living after four years with a persisting sinus.
One was living after two years with a persisting sinus.
One was living after one year but with a swollen abdomen and enlarged liver.

Of the 22 living and well:

2	cases	living	and	well	after	10	years.
1	case	"	"	"	"	8	"
2	cases	"	"	"	"	7	"
1	case	"	"	"	"	6	"
1	"	"	"	"	"	5	"
2	cases	"	"	"	"	4	"
6	"	"	"	"	"	3	"
4	"	"	"	"	"	2	"
3	"	"	"	"	"	1	"

Tuberculous peritonitis is then a very fatal disease; and even when there is improvement, the after-results are not very brilliant. Still one can never say what the outcome will be in a given case and some of the least promising turn out the best. One of the cases that recovered had, besides the peritonitis, pleurisy with effusion, pneumothorax and tubercle bacilli in the sputum.

THERAPEUTIC NOTE ON THE ACTION OF LECITHIN IN EXOPHTHALMIC GOITER.

By HENRY J. BERKLEY, M. D., D. Sc.,
Baltimore.

During the past few years there have been occasional publications concerning the benefit derived from the administration of the salts of phosphoric acid in Graves' disease, especially the sodium salt and the glycerophosphates. Thus, Vetlesen reports a series of forty cases treated with moderate doses of sodium phosphate, all of them being benefited in varying degree.

For the past three years I have used an alcoholic solution of lecithin, with very excellent results, in many cases of nervous asthenia (not psychasthenia), and much more recently have extended its service to a few cases of exophthalmic goiter with strikingly favorable effect.

Remarkably, the neurasthenics and goiter cases, despite the nauseous and disagreeable odor of the solution, cling to the remedy as an opium habitué does to that drug, and never seem to tire of it until the nervous symptoms have been allayed, and the gain in weight approaches the normal. Again, all goiter and asthenic patients who are placed on lecithin state that an hour after the medicine is taken "the nerves" are quieted, and for a time there is a cessation of the acute symptoms, such as tremor, and thereafter a slow return—at the first—after some hours. Some of the patients compare the tranquillizing effect to that of the bromides, but assert that it is much greater.

As an experiment, I have placed a number of cases of asthenia for alternate weeks on lecithin and a compound preparation of the glycerophosphates of sodium, calcium, iron, and manganese, either with or without the glycerophosphate of

quinine and extract of gentian, only to find that they lost weight with increase of the nervous phenomena on the glycerophosphates, and gained in weight with abatement of the nervous symptoms while on the lecithin. In each week the hyperalimentation and degree of enforced rest remained the same, so nothing could be attributed to differences in exercise or diet.

The lecithin preparation is a product which in some instances requires careful handling. When there is disturbed digestion it is out of place, and in such an event other remedies that are better suited to allay and restore to its normal condition the disordered alimentary canal, must first be employed. Again, in certain cases, its action should be carefully watched, lest it induce extensive erythematous rashes, to the annoyance and discomfort of the patient. Furthermore, lecithin, *per se,* is an entire failure without the assistance and support of a milk diet. I can recall no instance of its complete success in either asthenia or Graves' disease when milk was not tolerated, and at least one litre of milk must be taken, daily, by the patient.

We do not, however, rest on an entire milk diet in these cases, but allow all wheat foods, eggs, raw and cooked, all suitable green vegetables, as well as fruits, and only cut out meats, sweets, and especial foods which are known to disagree with the patient; and everyone has his own food idiosyncrasies, which must be respected. Patience, the careful notice of trivial symptoms, as well as their judicious treatment, will repay in the increased comfort of the patient.

None of the sufferers from asthenia, and but one of the cases of Graves' disease, was subjected to the full rest treatment in bed. At first such patients are compelled to rest from 9 o'clock p. m. to 9 o'clock a. m., and the remainder of the day is spent out of doors, practically idling (and even this, in the case of patients in poor circumstances, is often impossible). After the gain in weight is pronounced, and the nervous symptoms show signs of abatement, they are encouraged to take up the lighter portion of their daily routine, and if they still gain, more and more of the ordinary occupations of life are gradually added, though for the time being active exercise is always restricted.

Though lecithin is probably a constituent of every cell of the body, and especially of the neurons and leucocytes, its action as a medicine is not fully understood. As an erythrocyte producer, with *pari passu* increase of the leucocytes up to 18,000 per cubic millimeter, it has no equal, iron, manganese, phosphorus compounds, falling far behind it, as is shown in instances of pernicious anæmia, chlorosis, and ordinary anæmia. As a rule it acts best when hemoglobin is below 70 per cent and the coagulation of the blood is slow.

It is also conceivable that lecithin acts as an anti-thyroid hormone. When the thyroid secretion is overactive there is a progressive loss of bodily weight—digestion and assimilation being assumed as normal. When the thyroid hormones are in partial or entire abeyance—the same conditions applying—there is a progressive gain in the bodily weight. That an increase in weight follows the administration of lecithin is rather singular when it is remembered that the active constituent is phosphorus, which together with iodine—the peculiar stimulant of the thyroid gland—is usually recognized as an excitor to the secretions of the named gland.

Now, we have, apparently, the reverse action, the phosphorus nullifying the activity of the thyroid hormone, or to put it in the vulgate, we find the phosphorus compound stopping the active nervous symptoms in the two maladies, nervous asthenia and Graves' disease, maladies that upon the surface are entirely different in their etiology.

The most plausible explanation of its powers is that it stimulates (through the agency of the leucocytes) the resistive powers of the tissues in general to greater activity; probably, also, it increases the secretions of the closed glands, such as the suprarenals and portions of the pancreas, as well as assists in erythrocyte formation and increases the phosphorus content of the leucocytes of the blood.

A word further. We have not finished with the neurasthenic and Graves' cases when the lecithin has abated the active symptoms of disease. No resource of hygiene should be relaxed. Hyperalimentation should be continued indefinitely, the restriction of active exercise should be pursued until the last symptom of the malady has abated for weeks, and minute doses of arsenical salts, notably potassium and sodium combinations (not arsenious acid), should be resorted to in minute doses to help keep up the effect of the lecithin, for at this late stage the arsenical salts seem materially to aid the permanent recovery. The two chemicals, arsenic and phosphorus, are apparently antagonistic in their action, yet here we find them assisting each other in effecting the patient's recovery. Evidently we have not arrived at an unequivocal knowledge of these several chemical messengers, and a more widely extended investigation should be made in the laboratory. Indeed, the purport of this article is solely suggestive, and in no wise positive.

In order to determine in some measure the action of lecithin upon the organism, I had an investigation made at the Detention Hospital, which was confined to blood examinations, lecithin being given to healthy and diseased patients. A number of nuclein preparations, of American, as well as French derivation, were tried along with it. The aim was to induce a high leucocytosis together with an increase in the hemoglobin percentage. Of the various preparations used the alcoholic solution of lecithin was the only one that induced constant results, causing an increase in several instances of from 7000 up to 18,000, and never less than 12,000 leucocytes in healthy subjects; also, if there was a degree of anæmia present in those less healthy it produced a rapid increase in hemoglobin. If the hemoglobin was already high, no effect was induced beyond a moderate leucocytosis.

No effect upon the urinary secretions was noted during these experiments, beyond a moderate increase in the volume excreted. These results were in entire accordance with previous clinical observations.

Besides being a constituent of cells, particularly of the neurons, lecithin is found as a constituent of the basophilic

granules of the leucocytes; and the result demonstrated by the above investigation is that in all probability a portion of the substance is absorbed from the intestinal canal and used by the economy to further the production of these corpuscular elements of the blood, and, accordingly, may become a source of energy for the entire organism. In what state or condition it is absorbed into the blood-vessels of the gastro-intestinal tract is a matter of speculation. It is a fairly stable product, not oxidizing readily, and especially is this true of the alcoholic solution to which is added a small amount of glycerine.[1] Under especial conditions it splits up into fatty acids, glycerine, phosphoric acid, and cholin, but as the sum of its effects upon the organism is totally different from that of its constituents, it is probably fair to assume that it is taken up by the white corpuscles of the blood in an unchanged form, and distributed throughout the body.

I append the abstract histories of four cases of Graves' disease, two of them being of severe type, the others mild instances.

Case I.—Mrs. H. S.; æt. 28 years; no children. The patient had been in good general health up to July, 1907, and at that date weighed 169 lbs., which was above her normal weight.

In early August she became nervous, tremulous, sleepless, with rapid loss of flesh; her neck enlarged and her eyes became somewhat prominent. Dyspnœa and tachycardia followed. At times the patient was drenched in perspiration. Great weakness and slight blueing of the extremities followed.

She was first seen on October 18, 1907, at which date she weighed 101 lbs. The examination showed her eyes to be slightly prominent, the thyroid gland somewhat enlarged, with considerable pulsation of the neck arteries. The pulse rate ranged from 96 to 110, with high tension. There was accentuation of all the heart sounds. No von Graefe, Moebius, or Stellwag signs. Internal ocular reflexes hyperactive, especially the light and sympathetic reactions. Deep reflexes everywhere exalted, and the superficial ones very active. Muscular mechanical excitability extremely well marked. Dermographia brilliant. Hyperidrosis, especially well-defined about the hands and feet. The perspiration had a peculiar odor. Tremor was well marked, especially in the facial muscles and hands. She was very much disturbed by various obsessions which have made their appearance within the past two months. Neck measurement 29 cm. over the thyroid gland. Hemoglobin 68 per cent. Urine negative for albumin and sugar.

The patient was placed on lecithin and a full milk and egg diet, with a restriction of all unnecessary work, and was instructed to rest out of doors as much as possible. During the first week of this treatment she lost an additional pound. During the following two weeks she gained 7½ lbs., with considerable abatement of the nervous phenomena, the obsessions excepted. From this date there was a steady gain in avoirdupois and great general improvement. On December 15th her weight was 115 lbs.; the reflexes not so active; tremor hardly noticeable; dermographia faint; hyperidrosis lessening; and the thyroid decreasing in size. The heart sounds were now normal, pulse 84, steady, regular, tension 140 mm. The phobias and obsessions are not so prominent, and accordingly do not cause her so much distress.

An examination made on January 26, 1908, showed that the dermographia, reflexes, and tremor have entirely abated, but a lessened degree of mechanical muscular irritability still remained. Her obsessions were not prominent, and she is inclined to be ashamed of them. Pulse 72. Heart's action normal. The thyroid was still receding, and her neck vessels showed no signs of pulsation.

Her increase in weight continued, until in March it reached 125½ lbs., after which she did not gain, but remained stationary. The lecithin was now discontinued and the glycerophosphates were substituted, and to the end of June there has been no return of the nervous phenomena. Occasionally her obsessions still crop out in modified form, but are becoming more and more infrequent. Her neck now measures 27½ cm. over the thyroid gland.

The patient now presents every appearance of physical health.

Case II.—Miss K. L.; æt. 32 years. She was first seen on November 7, 1907. At this date there were headache, insomnia, vertigo, with marked mental irritability, as well as complete change of disposition. There had been very considerable loss of weight, how much is not known, as the patient was not acquainted with her normal avoirdupois, but she had been comparatively stout, with a height of 5 ft., 5 in. She weighed when seen 116 lbs. The skin was dry, pigmented, and in wrinkles over the face and neck and hands. There was slight exophthalmos, with a pulse constantly from 100 to 110. The tension was high. There was accentuation of all the heart sounds. The thyroid was above normal size, but not distinctly swollen, nor did the vessels of the neck pulsate greatly. A fine fibrillary tremor, intermingled with some coarser twitchings, was noticeable about the muscles of the face and hands, which increased on the slightest excitement. Neither the Stellwag nor von Graefe signs were present. The pupils were hyperreactive to light, the sympathetic and McCarthy stimulus. The deep and superficial reflexes were markedly increased, as was likewise mechanical muscular excitability, in the scapular, pectoral, brachial, and thenar muscles. Dermographia was not marked. Hyperidrosis and relaxation of the vaso-motor system were moderate. There was no disturbance of digestion. The urinary analysis was negative for sugar, albumin and indican. Hemoglobin 70 per cent. The menses were irregular..

Under lecithin and a special diet, combined with moderate rest, the symptoms gradually subsided, her mental irritability decreased and she again became even-tempered, while the dermographia, hyperidrosis, eye, superficial and deep reflexes returned to the normal. The pulse fell from 100 to 78-72 beats, the heart sounds became normal, and nothing but a muscular mechanical irritability, slightly above normal, remained by the middle of January, 1908.

At the end of December, 1907, Miss K. L. became fully convalescent, resumed her work in greater part, and though she has reported to me from time to time there has been no return of the symptoms of the nervous malady. In January her weight was 135 lbs., and there has been a slight gain since that date.

Case III.—Mrs. C. F.; æt. 32 years; married for four years; no children; normal weight 135 lbs.; seen for the first time May 4, 1907. She then complained of general nervousness, insomnia, tachycardia, some dyspnœa, and dyspeptic symptoms. In addition there were muscular weakness and shortness of breath on walk-

[1] The preparation of lecithin used in these investigations is prepared from the yolk of the egg by Messrs. Fairchild Brothers & Foster in their laboratory. In contrast to most of the emulsions, etc., now on the market, it appears to be entirely stable as well as of definite content, each fluid drachm representing a grain of lecithin, the equivalent of 1/25 gr. of organic phosphorus. A half-bottle placed on the table in my office on May 25, 1907, and subjected since that date to all room temperatures, also to frequent uncorkings, is now entirely unchanged in appearance as well as in therapeutic activity. These qualities it probably owes to the comparatively large amount of alcohol contained in the solution.

ing any distance. There were no indications of disturbed mental action, beyond restlessness, and a certain degree of inability to concentrate the thoughts. Her menses were very irregular.

The physical examination showed slight exophthalmos, a trifling swelling of the thyroid gland, with some pulsation of the neck vessels. The heart's action was forcible, tension somewhat high, the pulse constantly from 96 to 108 beats. All the heart sounds were accentuated. A mixed coarse and fine fibrillary tremor was noticeable about the face and hands. Mechanical muscular excitability was well marked in the extremities and pectoral muscles. The reflexes, deep and superficial, were plus. Hyperidrosis was only slight, and most noticeable about the hands. Dermographia was decided. The pupils were 2 mm., the internal reflexes hyperreactive to light, sympathetic and consensual stimuli. No von Graefe, Stellwag, or Moebius signs.

Hemoglobin 70 per cent. Coagulation good. Urine negative as to sugar and albumin. The patient was ordered rest, fourteen hours a day in bed, the remainder of the time idling on the porch, a diet mainly of milk and eggs, and a prescription of the glycerophosphates of iron, manganese, and sodium. She weighed 114 lbs., a drop of 21 lbs. since January, 1907. Two weeks later she weighed 111 lbs., and there was no appreciable lessening of the nervous symptoms. Lecithin was then ordered, diet as before, with a rest of 14 hours a day in bed. To this was added an abundance of water. On May 28 she weighed 118 lbs., and there was some slight indications of beginning subsidence of the heightened heart's action and exalted reflexes. The pulse had fallen to 84 beats per minute, while the high tension had decreased. During June she continued to gain in weight up to 124 lbs. At this date the dermographia, reflexes and tremor had markedly subsided, the insomnia had improved, the attacks of dyspnœa were infrequent, and she could take a moderate amount of exercise without inconvenience.

Toward the middle of June she left the city, and was given a prescription of sodium, calcium, manganese, and iron glycerophosphates with gentian, with instructions to continue it indefinitely, to restrict her exercise, and to continue on the diet. Once during the summer I heard from her to the effect that her nervous symptoms were more aggravated.

In September she again came under my charge. Her general condition was not nearly so bad as in the early part of May, but the reflexes, muscular mechanical excitability, hyperreactive pupils, as well as the tremor were quite noticeable. The thyroid gland had not increased in size, nor was the overaction of the heart so great, the pulse being steady at 90 beats. The weight had fallen to 118 lbs. She was again ordered rest in bed for 14 hours a day, with the balance of the time in the fresh air and sunlight.

The diet for the time was almost entirely milk in various forms, eggs, and fresh vegetables, something every two hours in small quantity, with lecithin thrice daily. Within three weeks there was a well marked improvement; the reflexes of all kinds had lessened in excitability, as had likewise muscular irritability; the tremor had ceased entirely, while the dermographia had vanished. The patient at the end of a month weighed 124¾ lbs.

Her diet was now considerably modified to a more ordinary one, with abundance of milk and no red meat, with lecithin every other week, and no medicine during the intervening time. The pulse was now steady at 80 to 84 beats, and by January 1 it had fallen to 78 beats. The heart sounds were entirely normal. The slight swelling of the thyroid gland had also receded. For the past six months she has been entirely normal, her nutrition is good, there is no nervousness, the pulse is stationary at 78 to 80 beats, and there is no high tension; also she sleeps well. The only thing abnormal is that she is obliged to avoid fatigue from any source. If for any reason she is overtired, she experiences a feeling of great muscular weakness and exhaustion, and requires to be absolutely quiet for twenty-four hours. During this asthenic state the pulse does not rise, nor is there any increase of the reflexes.

Case IV.—Mrs. M. S.; æt. 45 years. This patient has had a checkered career, but was in fair health up to seven years ago, when she was operated on for an "abscess of the ovary," then later for several minor pelvic conditions, ending four and a half years ago with ablation of the uterus and appendages.

Gonorrheal infection is certain; luetic very probable. About eighteen months ago she began to show the characteristic signs of Graves' disease, and underwent a partial thyroidectomy a year ago this past April. There was considerable improvement after the operation, but later a return of her old symptoms, which was followed eight months ago by a second partial lobectomy. For a few weeks after the operation there was a return to more normal conditions, then an increase of the symptoms of the malady.

The patient was admitted to St. Joseph's Hospital, April 7, 1908, suffering from "rheumatism" of the right shoulder, nausea, vomiting, and profuse hyperidrosis.

She presented the customary appearance of Graves' disease of moderately severe type, exophthalmos, rapid pulse, increased cardiac action, shortness of breath, dermographia, well marked tremor, with exaltation of the deep and superficial reflexes. Added to these were over-active pupils, profuse hyperidrosis, and exaggerated muscular excitability to mechanical irritation. A very small remainder of the thyroid body is palpable. The eyes bulge very appreciably, and there is some pulsation of the neck vessels. There is contraction of the upper lid during its descent, when the woman is requested to look downwards, but no marked von Graefe sign. The Moebius sign is present. Her weight is 117 lbs., considerably less than customary in a person of her height and physical development. There is a minor degree of general glandular enlargement, especially well marked in the posterior cervical glands. The urine was negative for glucose, but showed more than a trace of albumin. The blood examination gave leucocytes 9700 per cmm., with a differential count of neutrophiles 70.8 per cent, small mononuclears 24.4 per cent, large mononuclears 4.0 per cent, eosinophiles 0.4 per cent, myelocytes 0.4 per cent. There were no nucleated red cells.

The patient was placed, on admission, upon a milk diet and sodium salicylate, as well as local treatment for the inflamed joint. Later iodide of iron was administered, also aspirin, but without improvement, and the patient became very despondent. I saw her for the first time on April 23, and lecithin was ordered thrice daily. On every third day the lecithin was omitted, and thyroid extract in two-grain doses was given twice a day. Shortly the lecithin alone was given, the arthritis being ignored, except for local applications of ichthyol.

Soon, under lecithin, improvement began, the heart's action decreased in frequency and force, the dyspnœa ceased, hyperidrosis became less profuse, the tremor and muscular jactitations diminished in common with a decrease in the activity of the deep and superficial reflexes. The woman also began to increase in weight, as well as to look better nourished, while the skin tints became more natural, though the egg and milk diet that she was first placed upon was not altered in any way.

Owing to an error the lecithin was at this stage discontinued, with a revival within a few days of some of the more marked nervous symptoms. At the date of writing, June 30, 1908, the patient has been steadily on the lecithin for a month, and when I last saw her she volunteered the information that she had not been so comfortable for many months.

At the last physical examination her exophthalmos remained unchanged; her pulse had decreased from 100-90 beats per minute to 70-68, with entire regularity of rhythm, and absence of all high

tension. Dermographia was extremely faint, tremor had ceased completely, and her reflexes deep and superficial had returned to the normal. The ocular reflexes were also normal. Mechanical muscular excitability was slightly above par. The general nutrition had markedly increased, also the mental despondency had improved materially. Altogether, during the few weeks of the lecithin treatment the woman has surprisingly improved, and while not well, is constantly improving, and able to be about with more comfort than she has had during many previous months.

When she left the hospital July 14, the nervous symptoms had entirely abated.

To these four cases, I could add two others of the Graves' malady, in which the improvement was equally manifest under the action of lecithin, had I preserved the notes. Even with this addition the number treated with lecithin is too few to justify other comment than to suggest the possibility that in the combination of lecithin and milk we may have a remedy to counteract the disordered forces of the thyroid body, although I am by no means sure that the thyroid alone is responsible for the entire clinical phenomena of exophthalmic goiter.

AMBOCEPTORS AND COMPLEMENT IN TYPHOID SERA.

By Henry S. Denison, M. D.

(*From the Biological Division of The Medical Clinical Laboratory, Johns Hopkins Hospital.*)

It is now generally understood that earlier estimations of the baeteriolytic power of the serum in typhoid fever, made in vitro without the addition of complement, are of no value so far as quantitative estimation of amboceptor content is concerned. Such estimations showed in general no difference in baeteriolytic power between the serum of sick typhoid patients, on the one hand, and that of normal individuals, convalescent typhoids, or patients ill with other diseases, on the other hand.

In 1904 Stern and Korte (1) showed that, with addition of complement, the bacteriolytic power of the serum in typhoid fever (in vitro) is usually very great and exceptionally may be determined even in dilutions as high as 1/4,000,000. Hahn (2), with the same technique, found that in ordinary normal individuals and those suffering from other diseases than typhoid, bacteriolysis is evident as a rule only in dilutions less than 1/40, but may exceptionally show in dilutions as high as 1/1000. Korte and Steinberg (3) studied this form of immunity elaborately in 1905 and proved that the bacteriolytic power of the serum in typhoid fever rises during the height of the disease and falls again in convalescence, that it does not vary constantly with the severity of the infection, and is not peculiar to the severer types of infection.

In the fall of 1907 Dr. Rufus I. Cole suggested to me to follow the bacteriolytic power of the serum in some of the cases of typhoid fever then so prevalent in the wards. It occurred to me that it might be interesting to make two parallel series in some estimations—one with and the other without the addition of complement. I thought such a procedure might throw light on the complement as well as the amboceptor content, and hoped that such double determinations might be of value in prognosis, whereas the determination of amboceptor alone is not (as shown by Korte and Steinberg).

Method of Determining the Bacteriolytic Power.

The serum to be tested is obtained from the patient's finger, and the complement serum is obtained from the ear vein of a normal rabbit in capillary pipettes. A 24-hour bouillon culture of typhoid bacilli is employed.

A pistol-pipette of considerable capacity is made by bending one end of a glass tube at right angles, drawing the other (at least 12 cm. from the knee just formed) abruptly into a capillary bore, and breaking this off about 4 cm. from the constriction. After heating throughout, in order to sterilize, it is placed in a sterile test-tube to cool.

This instrument is held in the hand like a pistol, the bulb resting within the palm, which gives perfect control of drops issuing from it.

A series of sterile test-tubes are set up and marked with numbers corresponding to the desired dilutions, a few extra tubes (as many as there are digits in the highest dilution

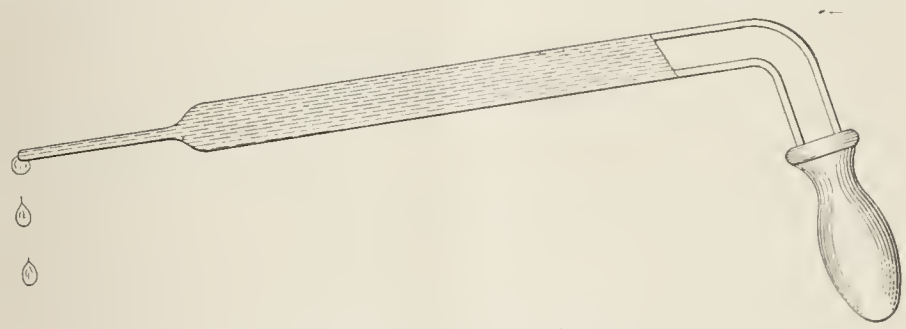

Fig. 1.—The pistol-pipette.

number) being set aside for other purposes. All are then charged with bouillon as follows:

Dilution tubes.	Drops of bouillon.
For dilutions beginning with *1* (as 10, 100, 1000, etc.) . . . . each	*9*
" " " " *5* (as 50, 500, etc.) . . . . . "	*8*
" " " " *25* (as 25, 250, etc.) . . . . . "	*6*
" control	10
The remaining tubes, for dilution-making . . . . . "	9
Tube for complement	$(d/2 + 1) \times 9$

(where d = number of dilution tubes with 1 added if necessary to make it an even number).

The serum dilution is then proceeded with according to the figured plan—supposing the series of dilutions decided upon to be 1/10, 1/25, 1/50, 1/100, 1/250, 1/500, 1/1000, 1/5000, 1/10,000 (Fig. 2).

The serum to be tested is sucked into the pipette. One drop is then placed in the 1/10 dilution tube, another in the first 9-drop mixing tube, the rest is blown out and the pipette washed with bouillon. The contents of the 9-drop mixing tube are now churned up by drawing back and forth into the pipette; then 4 drops thereof are deposited in the 25 dilution tube, 2 drops in the 50, 1 in the 100, and 1 drop in the next 9-drop mixing tube, after which the pipette is washed as before. This process is continued until all the dilutions have been made, when it will be found that each tube contains 10 drops of the desired serum dilution.

To make the complement dilution, $(\frac{d}{2}+1)$ drops of serum containing complement are added to the tube for complement, as noted above. This makes a dilution of the complement 1/10. To this tube is now added one-fifth as many drops of bacterial emulsion as there are drops already present. To prepare the bacterial emulsion we have found it most advisable to add one drop of a 24-hour bouillon culture of our stock ty-

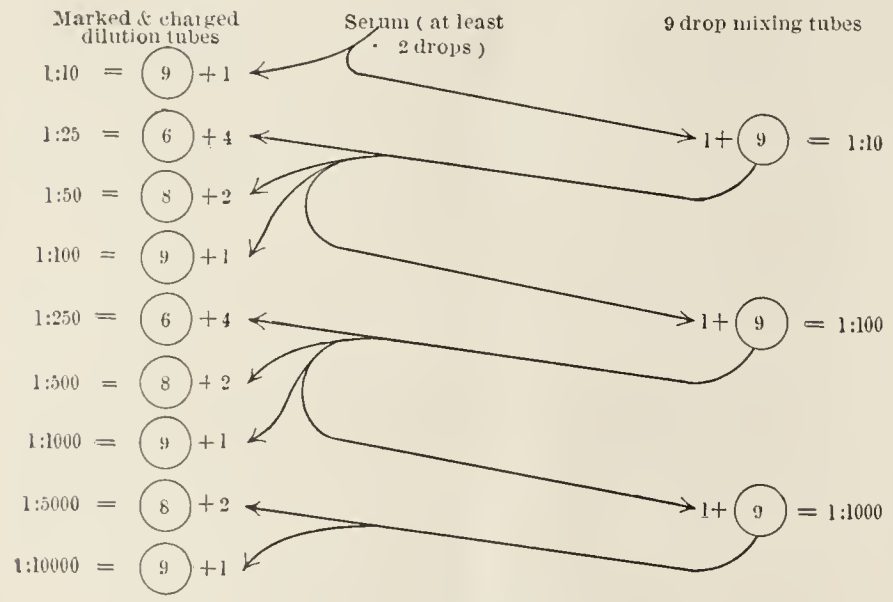

Fig. 2.—Dilution plan.

phoid bacillus to about 10 cc. of bouillon. This is thoroughly mixed by drawing it up into the pipette and forcing it out several times.

Six drops of the complement emulsion-mixture are then added to each of the dilution tubes including the control.

We now have a series of tubes each containing 16 drops of fluid. These are well shaken and incubated at 37° C. for 3 hours, then plated by pouring 10 cc. of melted agar into each tube and the mixtures thus formed into Petri dishes. The plates are incubated at 37° C. and read about 18 hours later.

In recording the results of investigations of this sort I have used cards ruled as shown in Fig. 3.

Abscissæ represent dilutions and ordinates the bacteriolytic power as shown by the numbers of colonies.

The plates are read by naked-eye comparison with the control and with each other. In this way a curve is formed representing observations of comparative numbers of colonies. The bacteriolytic power is expressed as the highest dilution on the curve before it reaches the control base-line (in the above case 1000).

The above is the method of determining amboceptor content only. To adapt it to the double determination with and without complement is merely the matter of a parallel set of dilution tubes, greater amount of mixing-tube material, and substitution of bouillon for complement in one series, the details of which will readily suggest themselves to any one.

Discussion of the Method.

This method differs from others heretofore used in several particulars. In the first place it is a drop method, the carefully graduated pipettes and double set of dilution tubes are unnecessary. Yet the method remains accurate if certain simple precautions are observed, to wit: (1) the tubes should be of large caliber so that drops will fall directly to the bottom; (2) the angle which the pipette makes with the tube in dropping should be approximately the same for each tube; (3) the same pipette should be used for one whole series of dilutions.

In the second place no inactivation is required. In a careful parallel series of observations with and without inactivation no difference could be made out between the two. The

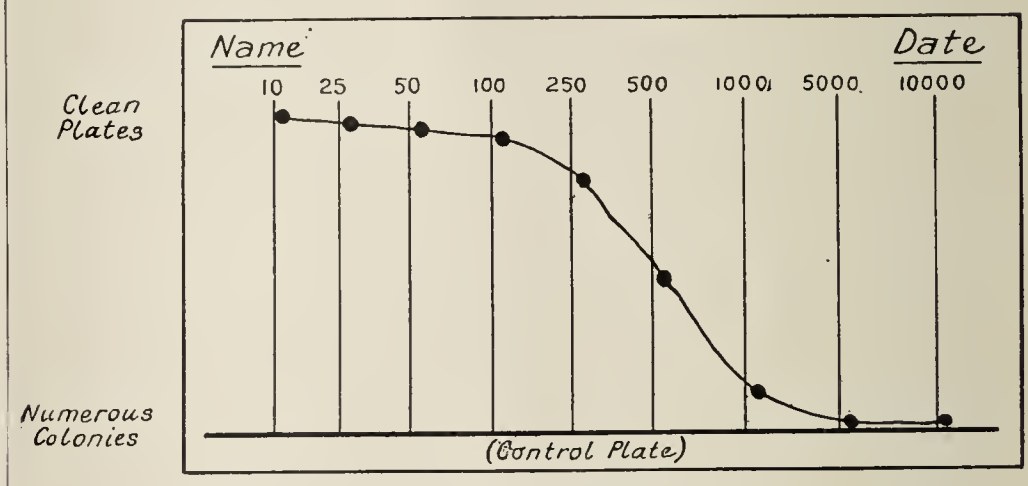

Fig. 3.—Record card.

amboceptors are saturated with complement so that very small differences in complement content existing possibly between normal and highly immune sera cannot be appreciated in the mixture. No Neisser-Wechsberg phenomenon (4) complicates the curves except in cases in which the bacteriolytic titre is above 100,000, and even in these cases the deviation is slight.

In the third place no accurate dilution of the bacterial culture is attempted, because so long as there are many colonies on the plate, and yet not so many that the individual colonies are indistinguishable, the results are approximately the same. Moreover, the rapidity of growth varies with the strain of bacteria used, and with the time such strain has been growing outside the body, etc., as well as with the exact composition of the media used. The important point is to get the right concentration of colonies on the plates, and, with Bacillus E., used for agglutination at the Johns Hopkins Hospital, I have found the rough dilution described above to give the most uniform and satisfactory results.

It might be objected that naked-eye comparison of plates is not as accurate as counting colonies, but as a matter of fact, with a little practice, it is more accurate. In three series of

plates I first constructed curves by the usual method of naked-eye comparison and then proceeded to count colonies. I found that, depending upon what parts of the plates were counted (for Petri dishes are never perfectly flat), the curve could be made regular or irregular at will, and even if one part were chosen, such as the center, the curve was markedly irregular. By counting different parts of the same plates, the descent to the control (marking the bacteriolytic power) could be fixed anywhere between 500 and 10,000 (*i. e.*, 500, 1000, 2500, 5000, 10,000) in one series; whereas, comparing the plates of this same series *as a whole* with the naked eye, the descent was uniformly placed at 2500, not only by myself, after shuffling the plates, but also by two others who happened to be in the laboratory at the time.

Results and Their Interpretation.

In the series of dilutions with equal and large amounts of complement added to each tube, it is evident that, as the concentration of amboceptors diminishes with the dilution, the

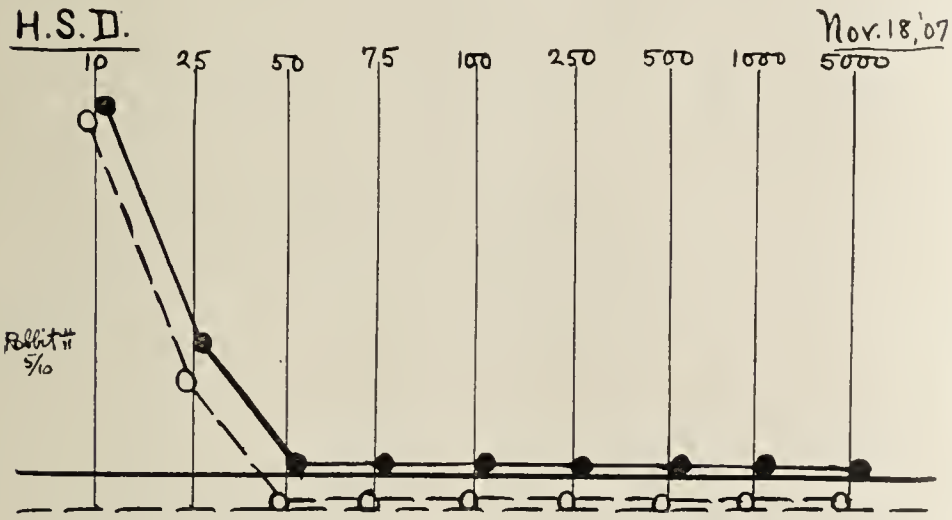

FIG. 4.—Numbers indicate dilutions. The heavy curve indicates bacteriolytic power with complement (5 drops of 1/10 normal rabbit serum), and the heavy base-line is the control. The dotted curve and base-line are the same without added complement. The difference in level between the two base-lines is due to the slight bactericidal power of the serum used as complement. Normal condition. Bactericidal power = 25.

relative concentration of complement increases; while, on the other hand, in the series without addition of extra complement, the complement already in the serum is diluted along with the amboceptors and the relative concentration remains unaltered. If now it can be shown that the amboceptors are in excess of complement in a certain serum—and this is the case if addition of extra complement increases the bacteriolytic power—then the determination of the bacteriolytic power *without* addition of complement is a measure of the available complement in that serum.

This is what was done by the earlier investigators, and, in those cases where excess of amboceptors cannot be demonstrated (mostly in normal persons, convalescents, or patients with other diseases), their results approximated the truth; but on the contrary, in those cases in which excess of amboceptors can be demonstrated (as in the course of the fever), their conclusions flew wide of the mark.

Bactericidal Power of Normal Serum.

Fig. 4 shows the behavior of a normal man. The heavy curve is the bacteriolytic power with the addition of com-

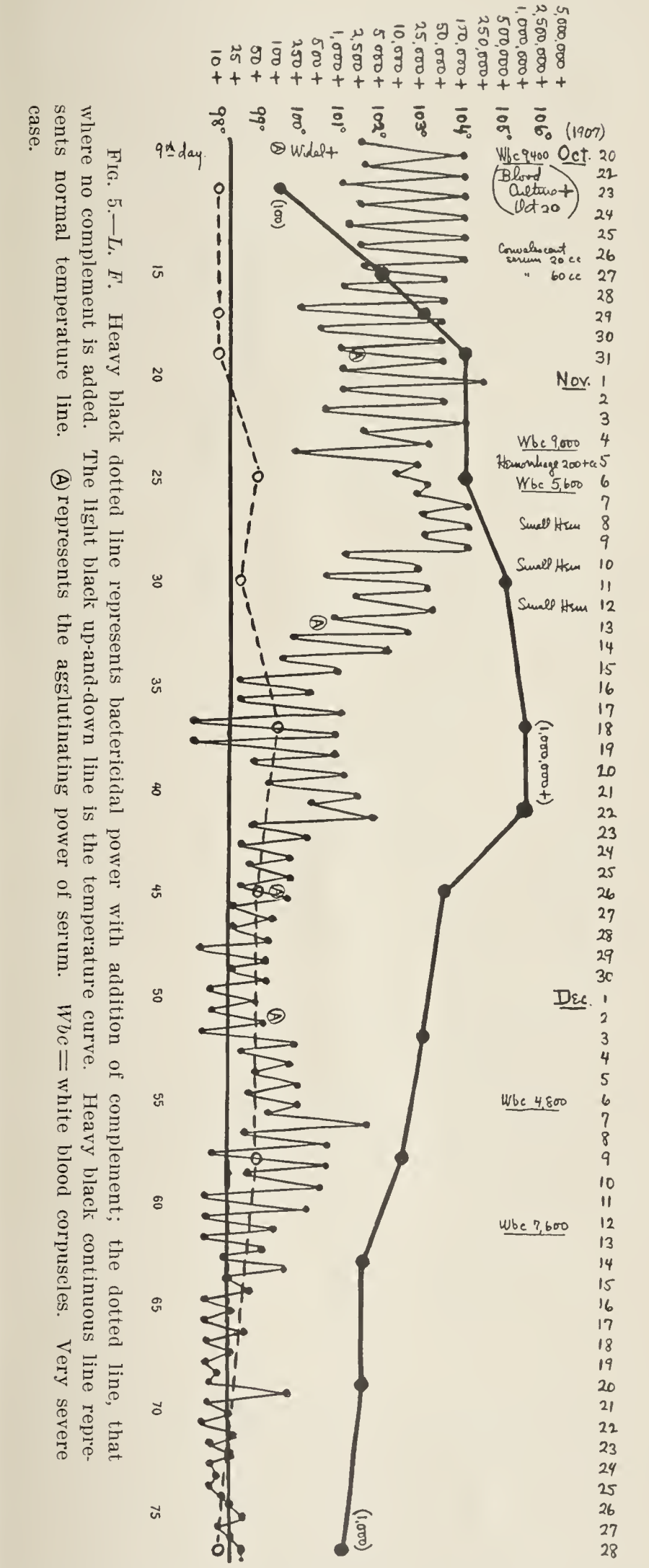

FIG. 5.—*L. F.* Heavy black dotted line represents bactericidal power with addition of complement; the dotted line, that where no complement is added. The light black up-and-down line is the temperature curve. Heavy black continuous line represents normal temperature line. Ⓐ represents the agglutinating power of serum. *Wbc* = white blood corpuscles. Very severe case.

plement, and the heavy base-line the complement control; the dotted curve is the bacteriolytic power without extra com-

plement and the dotted base-line the control without added complement. Both curves descend quickly to their respective controls (*i. e.*, before 50). There is no excess of amboceptors and they occur in comparatively slight amount (as shown also by Hahn).

There is certainly no lack of complement. If, on the other

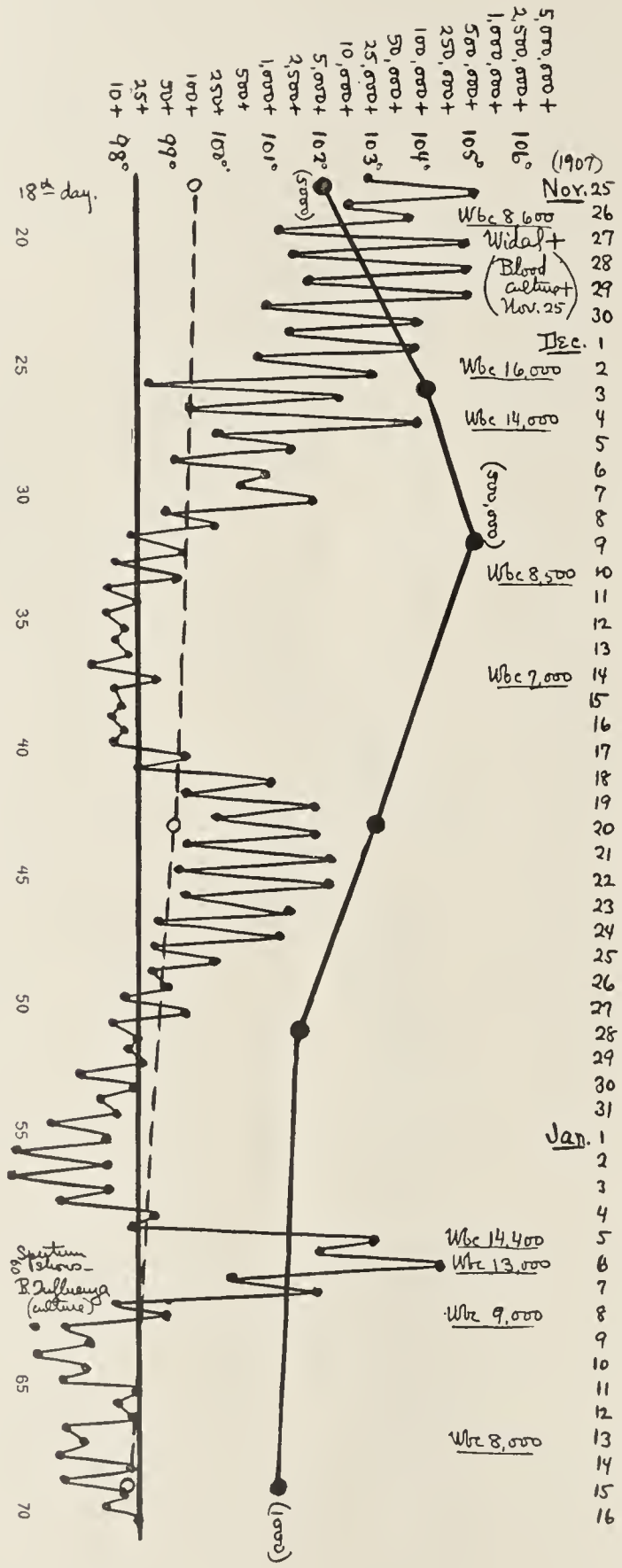

Fig. 6.—*R. A.* Curves as in Fig. 5. Relapse. Influenza.

hand, there is an excess it cannot be shown by this method. However, in such event, by adding to dilutions of normal serum equal and large amounts of inactivated normal or immune serum (*i. e.*, amboceptors), we would expect to get evidence of increased bacteriolytic power. Such experiments were made—at least with saturation by normal serum—and there was no increase in bacteriolytic power. I was unable to try saturation with inactivated highly immune sera because at the time that such experiments suggested themselves to me such sera were not obtainable. The determination of the amount of complement in normal serum, therefore, needs further investigation.

Bactericidal Power of the Serum During Typhoid Fever.

Amboceptors.—The bacteriolytic power (b. p.) shows the same changes as described by Korte and Steinberg, *i. e.*, rising in the first weeks of the disease and falling toward convalescence.

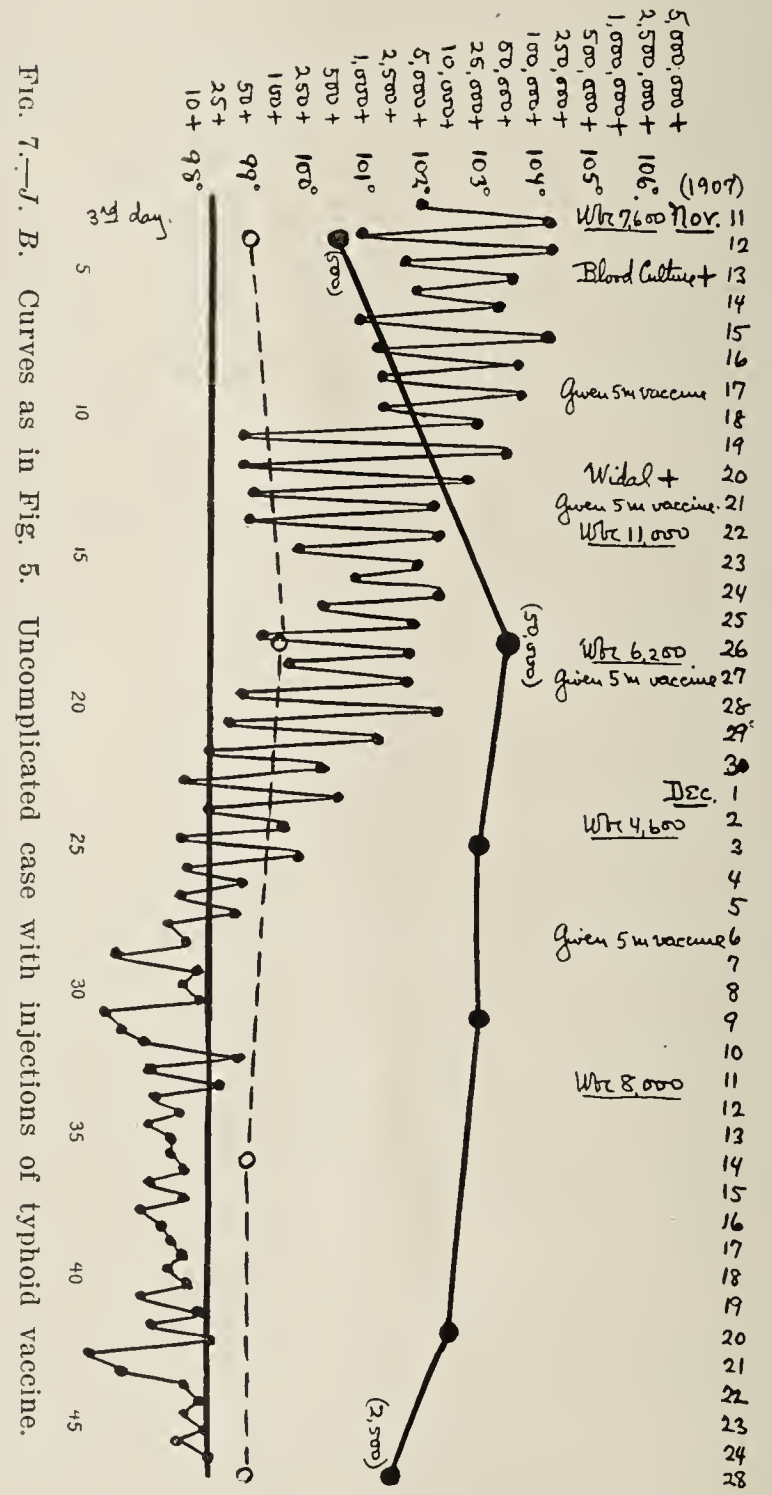

Fig. 7.—*J. B.* Curves as in Fig. 5. Uncomplicated case with injections of typhoid vaccine.

Mr. L. F., age 25, white (Fig. 5), showed the highest b. p. of any of my cases, reaching 100,000 on the 19th day of the disease and passing 1,000,000 from the 37th to the 41st day. Then began a steady fall, not even interrupted by a recrudescence on the 52d day. This case was marked clinically by extreme toxæmia, clearing up somewhat about the 24th day after a moderate hemorrhage. On the 14th and 15th days Dr. Barker ordered an injection of 80 cc. of serum taken from a convalescent, which was followed by no ascertained beneficial effect. The b. p. was rising at this time. Temperature finally reached normal on the 65th day.

Mr. R. A., age 19, colored (Fig. 6), shows a similar curve reaching 500,000 on the 32d day. On the 25th day this patient had pain, tenderness, and slight rigidity of upper right abdomen; leucocytes 16,000; and pus cells in the urine. Temperature

reached normal on the 34th day, followed by a relapse of 11 days' duration, starting on the 40th day. Convalescence was complicated by acute influenza about the 60th day, with recurrence of the abdominal pain and tenderness.

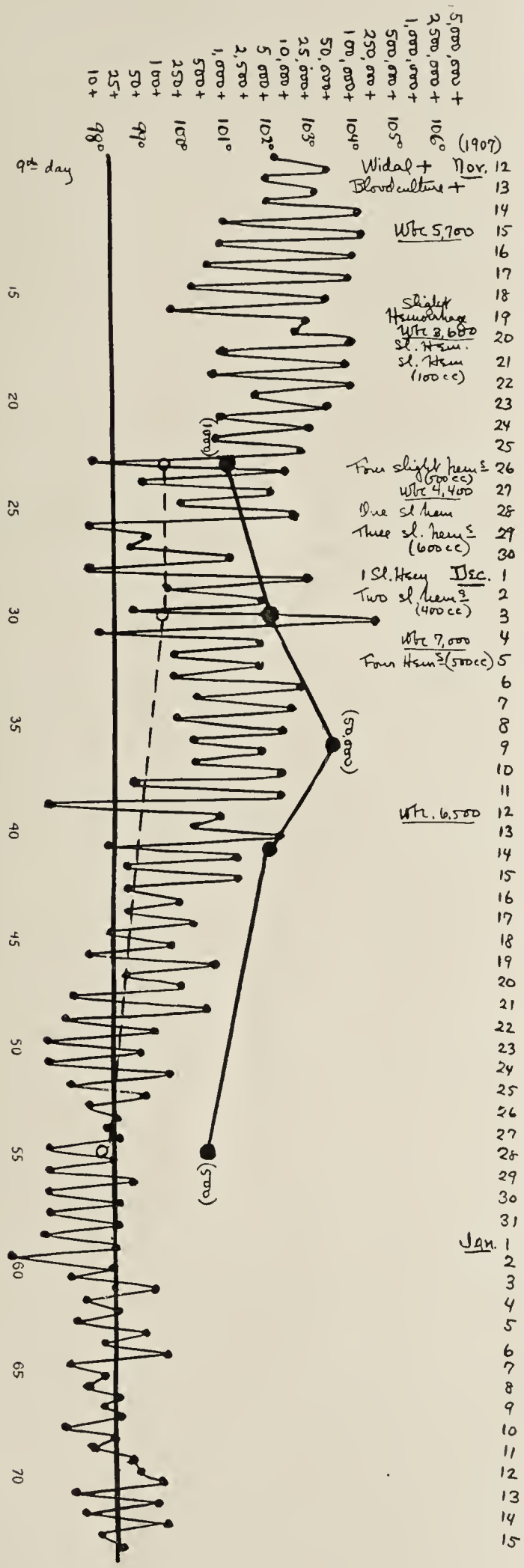

Fig. 8.—*T. H.* Curves as in Fig. 5. Hemorrhagic typhoid.

Mr. J. B., age 26, colored (Fig. 7), shows a b. p. reaching 50,000 on the 18th day and falling slowly thereafter. This case was given four injections of killed typhoid culture (5 cmm. Rosenau's autolysat), which may account for the persistence of b. p. so long after the fall in temperature, which came to normal on the 28th day.

Mrs. T. H., age 36, white (Fig. 8), shows a b. p. reaching 50,000 on the 36th day. This patient was very toxic, had many intestinal hemorrhages between the 16th and the 32d days of the disease, losing in all about 2000 cc. of blood—roughly estimated. She also had subcutaneous hemorrhages and a slight hæmoptysis. She entered the hospital with diacetic acid and acetone in the urine, and left with bacteria and pus cells. Temperature came to normal on the 54th day.

Complement.

The complement content of the serum in fever cases is interesting. It can be determined whenever addition of more complement by increasing the b. p. indicates an excess of amboceptors. This demonstration is nearly always possible in fever of any degree of severity. Serum from such cases, investigated without addition of extra complement, shows little more b. p. than normal serum—*i. e.*, contains only slightly more complement than normal serum. This holds true uniformly for the sera of high and of low b. p. (see Figs. 9, 10, and 11). The amount of complement as thus measured

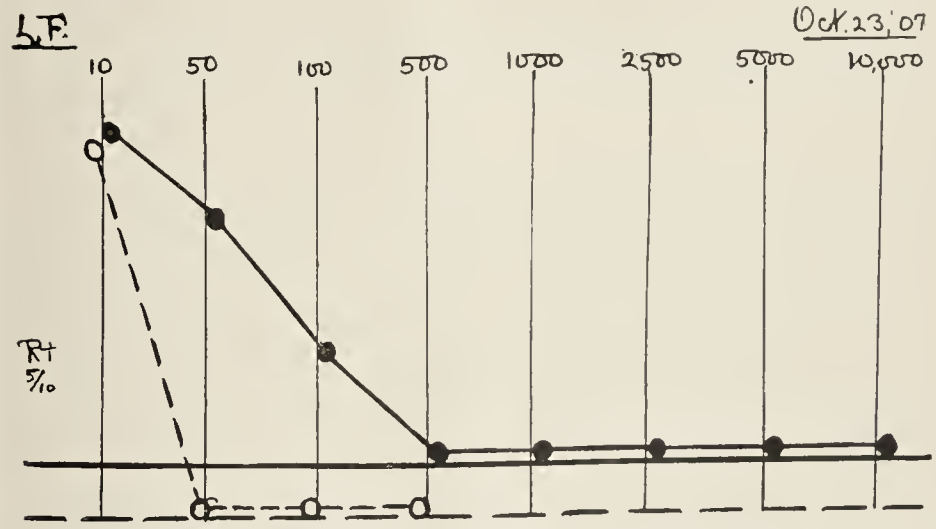

Fig. 9.—Severe case of typhoid on 11th day of disease. Lines signify same as in Fig. 4. B. p. = 100. Comp. = 10.

is very small and practically constant compared with the great changes in amboceptors, its effect never being seen in serum diluted more than 1/100, and usually only up to 1/50. Even in such powerful serum as was developed in the case of L. F. (Fig. 5), where the b. p. reached above 1,000,000, the complement on the same day was only 100 (see Fig. 10). Throughout the disease in all cases, the complement curve (dotted line, Figs. 5, 6, 7, and 8) hugs closely the base-line, no matter what spectacular increase or decrease the immune bodies may undergo. It is then demonstrated that at the beginning, the end, and throughout the disease, serum complement, available in vitro, is only slightly, if at all, increased above the normal amount.

Much more complement is doubtless available in the body. This is indicated by the experiments of Metschnikoff and Bordet with cholera (5), and Pfeiffer and Kolle with typhoid (6), demonstrating a markedly higher b. p. as determined in vivo, by the Pfeiffer method, than in vitro without addition of complement. But the work of Töpfer and Jaffé (7) may be interpreted to indicate that *even in vivo* complement is

deficient during the height of the fever. They found that, by the Neisser method (in vitro with added complement), the serum of sick typhoid patients showed greater b. p. than convalescents (as shown also above); whereas, by the Pfeiffer method (in vivo), convalescents showed greater power than sick patients. In other words, the bacteriolytic power at the height of the disease was much less in vivo than, with saturated complement, in vitro. Hence, there seems to be a lack

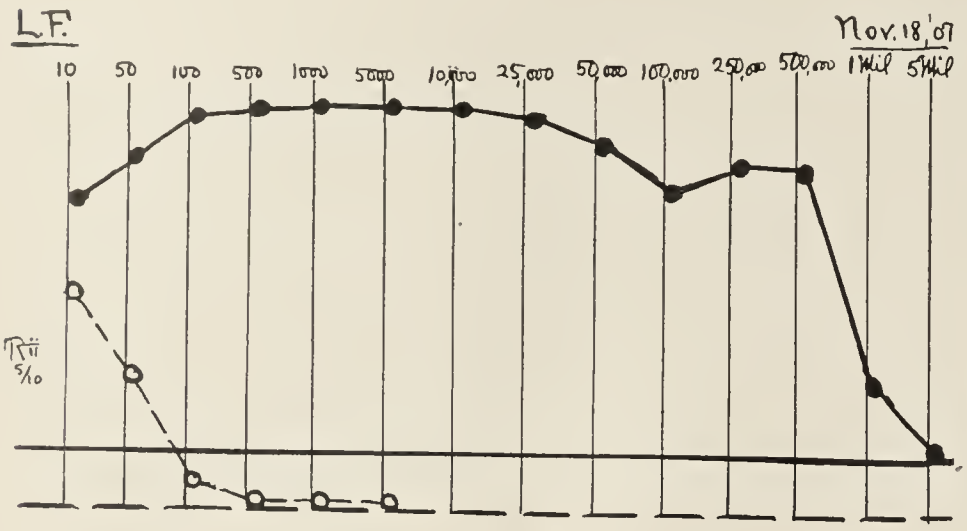

FIG. 10.—Same patient on 37th day of disease. B. p. = 1,000,000. Note Neisser-Wechsberg phenomenon in the low dilutions. Comp. = 100.

of available complement as compared with immune bodies in the body as well as in the test-tube at the height of the fever.

The question as to whether deficiency is due to deviation or to true absence of complement must be further studied. But that it is not due to deviation seems to me to be indicated by the fact that often in low dilutions (1/10) the serum without extra complement is quite as active, if indeed not more active, than with complement. If the deficiency were due to deviation, we would expect the addition of extra complement to increase the b. p. (as in Fig. 10, dilution 10). However, in these sera, the addition of extra complement either has no effect at 1/10 (see Fig. 9), or else actually diminishes the bacteriolytic power (see Fig. 11), making one wonder if it is not possible to have a deviation of amboceptors by an excess of complement as well as a deviation of complement by an excess of amboceptors.

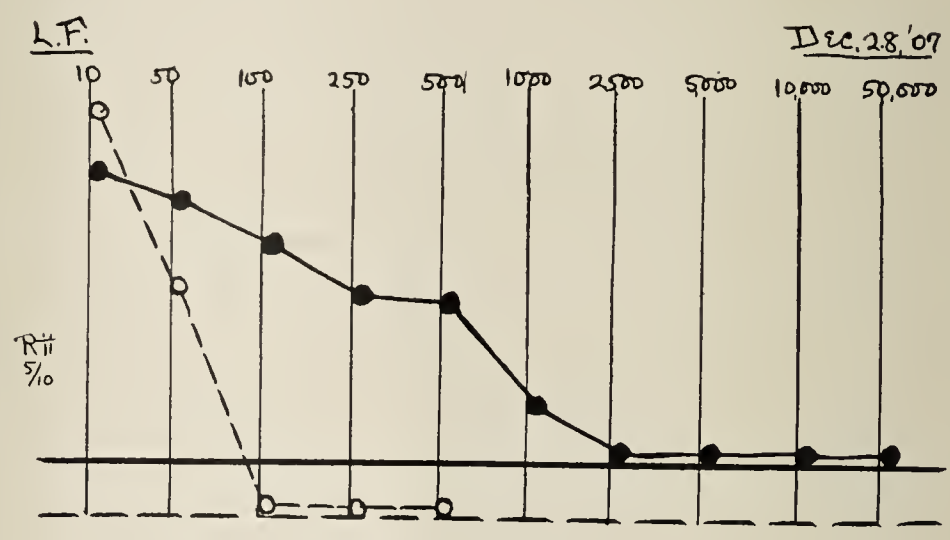

FIG. 11.—Same patient in convalescence. B. p. = 1000. Comp. = 50.

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THE HÆMOLYTIC ACTION OF BILE AND ITS INHIBITION BY BLOOD-SERUM.

By ANDREW W. SELLARDS.

(*From the Biological Division of The Medical Clinical Laboratory, Johns Hopkins Hospital.*)

The katabolism of higher animals includes processes for the disposal of mere waste material and also methods for avoiding injurious reactions. Interesting chemical reactions are known which show how adaptive changes can take place in the normal metabolism for protection against pathological emergencies. Equally definite protective agencies can be shown, by biological methods, against the toxic action of bile. In considering the features which indicate the toxic nature of the bile, one may call attention to its injurious action on the various tissues of the body as manifested definitely in its hæmolytic action (1) and in its etiological relation to acute hæmorrhagic pancreatitis (2, 3).

The following experiments consider the toxic action of bile and the normal mechanism for protection against this action. Of all the tissues in the body, the blood lends itself with especial ease and simplicity to the study of the toxic action of the bile. The material and the technique employed for these experiments were as follows:

The hæmolytic action of fresh bile and bile-salts was tested. Bile was obtained from the bladders of freshly slaughtered pigs. Sodium glycocholate and sodium taurocholate were obtained from Eimer and Amend (N. Y.). Two separate stocks of the bile-salts were procured. The same sample, however, was used in all of the different experiments except in Tables I and VI, where the preparations were made from a somewhat older stock which had been exposed to the light and air. In preparing the corpuscles, ½ to 1 cc. of blood was defibrinated and after centrifugalizing, the supernatant fluid was

removed. The corpuscles, after being twice washed by centrifugalization with physiological salt solution, were made up to a 2 per cent[1] emulsion in physiological sodium chloride solution. One-half cubic centimeter of this emulsion was then added to 1 cc. of varying strengths of the hæmolytic agent dissolved in physiological sodium chloride solution. This gave a final volume of 1.5 cc. in each preparation. The preparations were incubated for 2 hours at 37 ° C. in the usual manner, and examined after standing over night at about 8 ° C.

In all cases, 0.85 per cent sodium chloride has been used for physiological salt solution. Unless otherwise specified, the corpuscles and serum have been obtained from normal human blood. The quantities of bile and bile-salts given in the tables are the calculated values based upon the dilutions of stronger solutions.

TABLE I.—Comparison of the relative activity of sodium taurocholate and sodium glycocholate for normal human corpuscles.

Amount of bile-salt in milligrams.	Hæmolysis.	
	Sodium taurocholate.	Sodium glycocholate.
50	Complete.	Complete.
10	Complete.	Complete.
1.0	Complete.	Complete.
0.5	Complete.	Complete.
0.3	Complete.	Complete.
0.2	Complete.	Almost complete.
0.1	Trace.	Partial.
0.05	Trace.	Trace.
0.01	None.	None.
Salt solution	None.	

These data do not show any difference in the activity of the two salts. The glycocholate alone has been used in subsequent work.

TABLE II.—Determination of the activity of fresh bile for pig corpuscles.

Cc. of bile.	Hæmolysis.	Cc. of bile.	Hæmolysis.
1.0	Complete.	0.005	Trace.
0.2	Complete.	0.002	None.
0.1	Complete.	0.001*	None.
0.02	Complete.	0.0002	None.
0.01	Almost complete.	0.0001	None.
Salt solution	None.		

* The bile solutions when looked at in layers about 5 cm. deep, still showed some color, up to and including this dilution.

The amount of bile-salts found in bile varies widely, but usually lies somewhere between 1 per cent and 10 per cent. The percentage of bile-salts in the specimen tested was not determined, but its minimal hæmolytic dose would correspond to a concentration of 1 per cent if its activity is directly proportional to the amount of bile-salts present. Flexner (4) has found that rather large quantities of colloids inhibit the action of bile upon the pancreas. It is possible that the mucus present in the bile may exert some inhibitory action.

In this connection one might emphasize the value of investigating the quantitative and qualitative changes which occur in pathological alterations of the bile. Thus cases have been reported (5) of pigmentary acholia, the presence of bile-salts without any pigment, and on the other hand, cases in which the bile was almost free from bile-salts.

It is evident that the bile-salts constitute at least an important part of the active hæmolytic principle of normal bile. When glycocholic acid is boiled with acids or alkalies it breaks up in cholic acid and glycocol. We have not determined what portion of the molecule is responsible for the hæmolytic action.

TABLE III.—Determinations of minimal hæmolytic dose of sodium glycocholate for normal human corpuscles.

Weight of sodium glycocholate in milligrams.	Determination number.		
	I.	II.	III.
0.10	Complete.	Complete.	Complete.
0.08	Partial.	Complete.	Complete.
0.06	Trace.	Partial.	Partial.
0.04	Trace.	Trace.	Trace.
0.02	None.	None.	Trace.
Salt solution	None.	None.	None.

It is of interest to compare the quantities in this table with the minimal quantities of bile-salts which can be recognized by chemical tests. By the modification of Pettenkoffer's test as applied by Mylius (6) and v. Udránsky (7), it is possible to recognize as little as 0.033 milligrams of cholic acid,[2] and a slightly larger quantity, 0.05 mg., gives the characteristic absorption spectrum. The figures given in the preceeding table are, of course, more or less arbitrary since they depend upon the amounts employed in making up the hæmolytic mixtures. Volumes half as large could probably have been used with good results.

PROTECTIVE MECHANISM AGAINST BILE.

Normal serum exerts an effective inhibitory action against bile. To demonstrate this, a preparation was made in the usual way, except that 1 part of normal serum was added to 10 parts of the 2 per cent corpuscle emulsion. Immediately after mixing, the corpuscles were added to varying strengths of sodium glycocholate solutions. A control without serum was also made. The preparations with serum showed complete protection against 20 times the minimal hæmolytic dose and also complete protection against 8 times the dose required for complete hæmolysis. This experiment was repeated in order to test more completely the limits of the protective power of normal serum.

[1] For convenience, the sediment of corpuscles, as precipitated by centrifugalization, was regarded as 100 per cent.

[2] For comparing the weights of cholic acid and sodium glycocholate it is to be noted that cholic acid has a rather smaller molecular weight, glycocholic acid being represented by the formula, $C_{26}H_{43}NO_6$ and cholic acid by $C_{24}H_{40}O_5$.

TABLE IV.—Protective action of normal serum.

Serum dilutions.	Weight of sodium glycocholate in milligrams per tube.				
	0.1	0.08	0.06	0.04	0.02
1 : 30	None.	None.	None.	None.	
1 : 150	Trace.	None.	None.	Trace.	
1 : 300	Trace.	None.	None.	Trace.	
1 : 600	Trace.	Trace.	None.	Trace.	
1 : 1500	Partial.	Trace.	Trace.	Trace.	
1 : 3000	Partial.	Partial.	Trace.	Trace.	
1 : 15000	Complete.	Partial.	Partial.	Trace.	
1 : 30000	Complete.	Partial.	Partial.	Trace.	
Salt solution	Complete.	Partial.	Partial.	Trace.	Trace.

In the preceding experiment, a duplicate series of tubes was made for the comparison of the serum in a case of jaundice of three months standing resulting from a cancer of the pancreas.

TABLE V.—Duplicate of Table IV, using the serum of a jaundiced patient instead of normal serum.

Serum dilutions.	Weight of sodium glycocholate in milligrams per tube.				
	0.1	0.08	0.06	0.04	0.02
1 : 30	None.	None.	None.	None.	
1 : 150	None.	None.	None.	Trace.	
1 : 300	None.	None.	None.	Trace.	
1 : 600	Complete.	Trace.	None.	Trace.	
1 : 1500	Complete.	Partial.	Trace.	Trace.	
1 : 3000	Complete.	Partial.	Trace.	Trace.	
1 : 15000	Complete.	Complete.	Trace.	Trace.	
1 : 30000	Complete.	Complete.	Trace.	Trace.	
Salt solution	Complete.	Complete.	Trace.	Trace.	None.

In the 0.1 mg. preparations with serum in 1 in 150 and 1 in 300 dilutions there is a slightly greater resistance than in the corresponding tubes for normal serum (Table IV). The difference, however, is hardly great enough to be of any significance. Scandaliato (8) concluded that the protective power of the serum could be definitely increased. The increase, which he found, though rather slight and temporary, constituted apparently a true immunity, forming an exception, in the case of the bile-salts, to the general rule that well-defined chemical substances do not give rise to immune sera. Abel and Ford (9) report a similar exception for a chemical of rather different nature, namely a glucoside.

As to the nature of the active substance in the serum, we have tested only the effect of various degrees of heat upon 1 to 20 dilutions of the serum. After cooling the heated serum, the proper quantity of 100 per cent corpuscles was added to give a 2 per cent emulsion, and 0.5 cc. of this was added, as in previous experiments, to 1 cc. quantities of varying strengths of sodium glycocholate solutions.

In a similar heating experiment, the diluted serum was heated to 95° C. for 30 minutes. This caused practically no change in its protective action; the minimal hæmolytic dose of sodium glycocholate for corpuscles in salt solution being 0.06 mg., for serum in 1 to 20 dilution, 1.0 mg., and for the heated serum, 0.8 mg.

TABLE VI.—Showing the effect of heat on the protective property of the serum.

Milligrams of sodium glycocholate.	Salt solution.	Serum unheated.	Serum heated 30 min. at		Serum heated to boiling over free flame.
			60° C.	70° C.	
3.0	Complete.	Complete.	Complete.	Complete.	Complete.
2.0	Complete.	Complete.	Complete.	Complete.	Complete.
1.0	Complete.	Trace.	Trace.	Trace.	Trace.
0.8	Complete.	None.	None.	None.	None.
0.5	Complete.	None.	None.	None.	None.
0.2	Partial.	None.	None.	None.	
0.09	Trace.	None.	None.	None.	
0.06*	Trace.	None.	None.	None.	
0.03	None.	None.	None.	None.	
0.01	None.	None.	None.	None.	

* This minimal hæmolytic dose is not included in Table III, as these preparations were made with an older solution of sodium glycocholate. The proteids, precipitated during the heating, were not filtered out.

Related work on the inhibition of cytolytic agents by serum has been reported by Longcope (10). He finds that serum of high concentrations prevents autolysis. This effect is not to be accounted for by the alkalinity of the serum and cannot be reproduced by Ringer's solution. Heating to 85 ° C. was found to cause only a very slight diminution in the effectiveness of the serum in preventing plasmolysis.

Bayer (11) has also found that normal serum inhibits the hæmolytic action of bile. In looking for the active principle of the serum, he finds that lecithin possesses some inhibitory action, but not in the quantities in which it occurs in the blood. Bayer concludes that the inhibitory agent of the serum rests largely, if not entirely, in the proteid constituent. Digestion of the serum or its proteids by tripsin, pepsin, or papayotin destroys this protective property. In a later paper (12) he has also shown that bile effects solution of lecithin emulsions in a manner somewhat analogous to the lysis of corpuscular emulsions. Under favorable conditions serum also inhibits this action of the bile on lecithin emulsions. These facts form the basis of the hypothesis that the bile-salts may cause hæmolysis by their action on the lecithin of the red blood corpuscles.

Another phase of the activity of bile is seen in its accelerating effect upon the fat-splitting ferments (13, 14). The relation of serum toward this reaction has not been investigated.

CONCLUSIONS.

(1) Bile and bile-salts are active hæmolytic agents *in vitro*.

(2) Normal serum protects effectively against the hæmolytic action of bile. In serum dilutions as high as 1 to 3000 a trace of this protective action still persists. Precipitation of the proteids by heat does not affect this inhibitory property of the serum.

These facts have a direct bearing upon the explanation of acute hæmorrhagic pancreatitis, following the injection of bile. There is a necrosis of the pancreas, caused by the bile, and the hæmorrhage would presumably tend to neutralize the action of the bile.

Except for the protection afforded by the blood serum, a simple catarrhal jaundice might perhaps be followed by

serious consequences such as the development of a severe secondary anæmia.

It gives me much pleasure to acknowledge the advice and assistance of Dr. R. I. Cole in carrying out this work.

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THE EFFECT OF HEATED SERUM ON ROULEAUX FORMATION OF RED-BLOOD CORPUSCLES.

By ANDREW W. SELLARDS.

(From the Biological Division of The Medical Clinical Laboratory, Johns Hopkins Hospital.)

Investigations of various types of immunity have consistently shown that foreign cells and cell-products of widely divergent races are more active in stimulating the production of immune bodies than those of closely related species. This principle applies especially well to the production of hæm-agglutinins and hæmolysins. Hæmolytic sera can be developed rather easily by injecting the corpuscles of a widely different race, as for instance avian corpuscles into mammals. In using animals of closely related species, immune sera are produced more slowly and they possess less activity. In the same species, iso-lysins cannot be constantly obtained, while in the same individual, auto-lysins are unknown. Of all the immune bodies which are known, agglutinins are the most readily obtained and are very active in high dilutions. They are not only easily produced in closely related species, but also in the same species. In the case of man, they exist normally, in a large percentage of individuals, as iso-agglutinins. Auto-agglutinins, as would be expected, are unknown. Rouleaux formation of red corpuscles, however, a phenomena closely related to agglutination, may be shown to occur on combining the serum and corpuscles of the same individual.

The following is a report of experiments dealing with auto-roulcaux formation and the artificial production of a serum causing rouleaux formation.

In an emulsion of red-blood corpuscles in salt solution, microscopic examination shows that the corpuscles are very evenly distributed. In a control preparation consisting of equal volumes of washed corpuscles and unheated serum, only a very slight change is seen. The corpuscles are somewhat less uniformly distributed throughout the field and a very few short rouleaux are present. If, however, a volume of washed corpuscles be mixed with an equal volume of serum, which has been heated to 60°, a very definite change occurs at once. Practically no free corpuscles are seen, but they are arranged in long symmetrical rouleaux, which form a rather coarse net-work throughout the preparation.

EXPERIMENTAL PART.[1]

I. Determination of the Optimum Temperature for Producing a Maximum Strength of Serum.

As a preliminary test, samples of undiluted serum were heated at 45°, 50°, 60°, and serum diluted 1:10 at 70° C., using three periods of time, namely, 15, 30, and 60 minutes for each specimen. Characteristic rouleaux formation was seen in all of the preparations at 60° C. The serum samples heated at other temperatures did not differ from control preparations with normal serum. To determine the limits more exactly, this experiment was repeated, using temperatures at 55°, 60°, and 64° C., and employing time intervals of 15, 30, and 60 minutes as before. In order to estimate the strength of the serum, each sample was tested in three dilutions. The corpuscles were used in 10 per cent emulsion. As seen from the following data, a slight dilution of the serum produces a very marked effect.

TABLE I.—Determination of the effect of heating and diluting the serum on its property of causing rouleaux formation.

Time of heating in minutes.	Temperature.								
	55° C.			60° C.			64° C.		
	Dilution			Dilution			Dilution		
	1-2	1-4	1-6	1-2	1-4	1-6	1-2	1-4	1-6
15	0	0	0	+	Tr.	0	+	Tr.	0
30	+	0	0	+	+	0	+	0	0
60	+	0	0	+	+	0	(Coagulated.)		

[1] In these experiments, human corpuscles and serum have been obtained from the same individual, the blood being collected from the finger. In preparing the corpuscles, about ½ cc. of blood was decalcified in 10-12 cc. of a solution containing 0.85 per cent sodium chloride and 1 per cent sodium citrate. The corpuscles were collected by centrifugalization and were rewashed with 10-12 cc. of 0.85 per cent sodium chloride solution. Capillary pipettes as employed by Wright[2] have been used for mixing equal volumes of the corpuscular emulsion and the fluid to be tested. For the microscopic preparations, the mixtures have been examined in ordinary hanging-drop mounts after standing for one hour at room temperature, except where other conditions are specified. Absolute asepsis was not employed, but the usual precautions for hæmolytic and agglutinating technique were observed.

[2] Wright and Douglas: Proc. Roy. Soc., Lond., B., 1903, LXXII, 357.

The serum dilutions are given for the final concentrations of the mixtures after the addition of the corpuscular emulsion. From these results, a temperature of 60° C. for 30 minutes was decided upon as a good working basis and has been used in all subsequent experiments.

II. Effect of the Concentration of the Corpuscular Emulsion.

In order to determine the most desirable concentration of corpuscles, emulsions were made of varying strengths[3] and tested with the following results:

Strength of emulsion	0.2%	0.5%	1%	2%	5%	10%	20%	50%	100%
Result.....	0	0	0	Partial	+	+	+	+	+

In preparations which have stood for several hours, the rouleaux break up and the corpuscles again become isolated. The more positive result in the higher concentrations was also shown by the earlier breaking up of the 5 per cent and the 10 per cent emulsions, which occurred in 8 to 10 hours, whereas the rouleaux in the 100 per cent preparation broke up only after 48 hours. In a repetition of this experiment similar results were obtained. In all of the subsequent work, 10 per cent corpuscular emulsions in salt solution have been used and the data given apply to this concentration.

III. Comparison of Roulcaux Formation with Agglutination.

The arrangement of the red corpuscles in rouleaux differs from that of the agglutinated corpuscles. Comparisons were made with immune and normal agglutinating sera. About the same arrangement was obtained of pigeon corpuscles agglutinated by specific rabbit serum and of human corpuscles having undergone iso-agglutination. In the agglutinated preparations rouleaux were present, but they were rough and irregular, and the corpuscles exhibited a marked tendency to collect in clumps about central nuclei, whereas in the rouleaux preparations, the corpuscles are arranged in long chains forming a net-work.

IV. Relationship Between Serum and Corpuscles of Different Individuals.

A few preparations were made in order to test the constancy of roulcaux formation in heated serum of various individuals and also to determine whether the serum and corpuscles of various individuals could be used interchangeably, *i. e.*, whether the heated serum of one individual would be active for the corpuscles of another person. Samples of blood were collected from three normal individuals and specimens of heated serum and washed corpuscles were prepared. Each of the three serum samples was tested against the three different corpuscle emulsions and the nine possible combinations all gave typical rouleaux formations. Control preparations with the unheated serum showed that iso-agglutinins were present in four of the six possible combinations. In the heated sera in which iso-agglutinins were also present, both the morphological characteristics of agglutination and rouleaux formation were present, but the roulcaux appearance was most marked.

Expressed in tabular form, the results were as follows:

Control tests with unheated serum and corpuscles of three individuals, read after two hours.

Serum.	Corpuscles. A.	B.	C.
A	.....	Agglutination.	0
B	Agglutination.	.....	Agglutination.*
C	0	Agglutination.	.....

* The other positive results appeared immediately upon mixing, but this one appeared only after standing for one hour.

Heated serum tests, read after two hours.

Serum.	Corpuscles. A.	B.	C.
A	Rouleaux.	Rouleaux and agglutination.	Rouleaux.
B	Rouleaux and agglutination.	Rouleaux.	Rouleaux. Agglutination(?)
C	Rouleaux.	Rouleaux and agglutination.	Rouleaux.

In the determination of the effect of heat upon agglutinins, even in macroscopic tests, little confusion can be caused by rouleaux formation since this property of the serum is lost in a 1 to 6 dilution, whereas the agglutinating property persists in much higher dilutions.

V. Changes in the Serum and Corpuscles After Standing.

The fact that the rouleaux in the heated serum mixtures break up in the course of a few hours suggested the possibility that either the corpuscles or the serum, after standing for a few hours, might fail to react. In a preliminary test, a corpuscular emulsion, immediately after preparation, gave a characteristic reaction with heated serum. After standing for seven hours at room temperature, about 28° C., it was again tested with freshly prepared serum and failed entirely to give any reaction. A serum sample was then tested which had stood for 22 hours at room temperature before heating to 60° C. and gave only a trace of rouleaux formation. The corpuscular emulsion against which it was tested had been freshly prepared and gave the usual reaction with fresh serum. Normal serum, tested at more frequent intervals, showed a definite loss of power to produce the reaction after standing 12 to 14 hours at room temperature before heating, but the deterioration was not complete till after 28 hours. Heated serum, on the other hand, retains its activity at room temperature. A specimen which had stood for 26 hours at 25° to 28° C. showed no deterioration.

In order to confirm the preliminary results with the corpuscles, an emulsion was kept at room temperature, about 30° C., and tested every hour with heated serum. Marked deterioration of the rouleaux-forming property was noted at the end of 5 hours and finally became complete at the end of

[3] For convenience, these concentrations are calculated upon a basis of 100 per cent for the concentration of the sediment of corpuscles obtained by centrifugalization.

9 hours. Beginning with the 5-hour period, each test was controlled by a fresh active emulsion of corpuscles, giving positive results. To determine the effect of temperature upon the deterioration of the corpuscles, one emulsion was kept at 37° C. and a duplicate at 0° C. The emulsion kept at 37° C. gave only a minimal reaction at the end of 9 hours. A second test at the end of 22 hours showed no rouleaux whatever, whereas the activity of the corpuscles kept at 0° C. remained unaltered. This result was controlled by making two hanging-drop preparations for rouleaux in the usual manner, one of which was kept at 37° C. and the other at 0° C. The hanging-drop kept at 37° showed almost complete separation of the rouleaux at the end of 8 hours, whereas the preparation kept at 0° was practically unaltered at the end of 21 hours. Neither the serum nor the corpuscles were kept entirely sterile in these tests and the growth of bacteria would offer a possible explanation for the changes which took place.

VI. Rouleaux Formation in Various Diseases.

Since the deterioration of the serum and corpuscles took place with such relative rapidity, it seemed possible that similar changes might occur in the body under pathological conditions. A few preliminary tests were made in the following diseases: gastric carcinoma, ulcerative endocarditis, milliary tuberculosis, typhoid fever, and Hodgkin's disease. The typhoid fever patient was examined early in the course of the disease before specific agglutinins had appeared in the serum. In the tuberculosis patient, the diagnosis was made from the clinical signs and not from the bacteriological findings. Specimens of serum and corpuscles were obtained from each patient and also from a normal individual. Three preparations were then arranged for each specimen of blood to be tested, namely, (1) patient's serum and patient's corpuscles, (2) patient's serum and normal corpuscles, (3) normal serum and patient's corpuscles. All of the preparations gave positive results without material differences from the normal type except in the case of Hodgkin's disease. In this series, the first and third preparations, both of which were made up with patient's corpuscles, failed to give a good result. At most, only a few rouleaux were seen and these were limited to small areas of the preparation. The second preparation of the series containing the patient's serum and normal corpuscles, gave a fairly characteristic result. This indicates that the corpuscles were at fault and that the serum was fairly active. The change in corpuscles in this case cannot be considered as a terminal event, for the patient was in fairly good condition when the test was made, whereas the test upon the patient with endocarditis was made only two days before death. Little significance can be attached to this isolated result, however, and the emphasis must be laid upon the constancy of the positive results under pathological conditions. Hektoen,[4] in studying iso-agglutination, found no definite changes in a variety of infectious diseases.

VII. Nature of the Change in the Heated Serum.

The following point is of theoretical interest. During the heating of the serum is a new rouleaux-forming substance produced or is an anti-substance destroyed? Neither supposition is exactly correct. The most satisfactory explanation is that a rouleaux-forming substance, already present in the serum, is increased by heating. The experiments which led to this conclusion are as follows:

(1) Mixtures of equal volumes of normal serum and heated serum form rouleaux slightly better than equal volumes of heated serum and salt solution, *i. e.*, normal serum does not inhibit the action of heated serum but aids it slightly. This experiment was repeated three successive times with the same result. Four preparations were used, namely, (a) equal volumes of corpuscular emulsion and heated serum in 1 in 2 dilution in salt solution, (b) equal volumes of corpuscular emulsion and of heated serum diluted with an equal volume of normal unheated serum, (c) equal volumes of corpuscular emulsion and unheated serum diluted with an equal volume of salt solution, (d) and lastly, equal volumes of corpuscular emulsion and salt solution. In a fourth repetition of this experiment, macroscopic preparations were made in test tubes instead of hanging-drop mounts. The corpuscles in the two preparations containing heated serum settled out and left a clear supernatant fluid after standing for 30 minutes at room temperature. The corpuscles in the two preparations without heated serum settled out only after a period on one and one-half hours. The microscopic test was repeated again in duplicate with the following slight modification: mixtures of heated and unheated serum were digested for two hours at 37° C. before the addition of the corpuscles and preparations were then made as in the previous experiment. This digestion with normal serum did not diminish the activity of the heated serum, but rather increased it, giving results similar to the previous tests.

(2) A mixture of unheated serum and an equal volume of a 10 per cent emulsion of washed corpuscles always shows a few short rouleaux and a rather uneven distribution of the corpuscles throughout the field, a definitely different picture from a suspension of washed corpuscles in salt solution.

Summary.

I. Normal human serum when heated to 60° C. for 15 minutes or longer, develops a property of causing human erythrocytes to collect in rouleaux.

II. This property is not due to the destruction of an antibody by heat, but to a definite increase of a normal property of the serum.

III. The test may be applied either macroscopically or microscopically. The reaction increases in direct proportion to the concentration of the corpuscles.

IV. This property of the blood deteriorates rapidly.

(1) Corpuscles no longer form rouleaux after standing 7-9 hours at room temperature, but do so after at least 24 hours at 0° C.

(2) Unheated serum loses this property in 24 hours at room temperature.

(3) Heated serum retains this property for at least 24 hours at room temperature.

(4) In preparations kept at room temperature, the rouleaux

[4] Hektoen: J. Infect. Dis., Chicago, 1907, IV, 297.

break up completely in approximately the same time as that required for the deterioration of the corpuscles. Preparations at 0° C. keep well for 24 hours.

V. The rouleaux reaction differs from agglutination.

VI. The production of rouleaux in mixtures of serum and corpuscles from healthy persons has been constant, as far as tested, and is also fairly constant in mixtures of serum and corpuscles from diseased persons.

In conclusion, the writer wishes to acknowledge the assistance and suggestions of Dr. R. I. Cole during the course of this investigation.

AN INSTRUMENT FOR THE DETERMINATION OF VENOUS PRESSURE IN MAN.

By D. R. Hooker, M. D., and J. A. E. Eyster, M. D.

(*From the Physiological Laboratory of the Johns Hopkins University.*)

This report is presented for the purpose of demonstrating an instrument for the determination of venous pressure in man and to give a few examples of its use in clinical cases. These cases alone are insufficient to establish the fact that the determination of venous pressure is of clinical importance, but together with theoretical considerations, they suggest the possibility that in certain conditions such determinations may be of assistance both in diagnosis and prognosis. It is with the hope of arousing interest in this possibility that we presume to present this somewhat incomplete report.

The first article dealing with venous pressure in man with which we are familiar was published by Frey (1) in 1902. This article consists mainly of a theoretical consideration of the possible value of determinations of venous pressure in man together with a description of an instrument for measuring such pressure. The instrument here described determines the weight in grams necessary to cause the vein to collapse. The technical difficulties in using such an instrument, together with the fact that it is ill-suited to determining fluid-pressures, renders further consideration unnecessary. Two years later, v. Basch (2) studied venous pressure in man by forcing air into a small glass cylinder, which was placed over the vein, until the vessel collapsed. The pressure at this instant was read off on a water manometer. This work of v. Basch represents the first rational attempt to study venous pressure in man. It cannot be regarded, however, as satisfactory, because the pressure necessary to hold the glass cylinder in place is liable to cause a mechanical constriction of the vessel investigated. This principle has since been employed by v. Recklinghausen, and is the one upon which the apparatus we have used is based. In the same year, 1902, Gaertner (3) devised the following excellent method. He slowly raised the arm of the subject and observed the instant at which a particular vein collapsed. Whereupon he measured the height of the vein above the heart and concluded that this measurement represented in centimeters of water the pressure within the right auricle. Frey had previously called attention to this method, but apparently he regarded it as of merely theoretical interest, although he later laid claim to priority in it. By this method Gaertner made numerous observations of venous pressure in pathological cases. Such determinations varied in different cases from 9 cm. to 40 cm. of water. He cites one interesting case.—An old and very stout woman was brought to the hospital in an ambulance. Examination of the heart and lungs was negative. The determination of the venous pressure gave a reading of 20 cm. When the patient recovered it was ascertained that she had had great difficulty in climbing stairs and was in the habit of resting upon each step. Gaertner believes that the venous pressure in this case revealed an organic cardiac disturbance not otherwise diagnosed. The advantage of Gaertner's method is clear. The only apparatus necessary is a measure with which to determine the height of the collapsing vein above the heart and one would think that it might be of no infrequent assistance to the practitioner. Slight abnormalities would doubtless be missed, but in the more severe cases of venous stasis there could be no doubt of the increase of pressure.

Reference should also be made to the work of Sewall (4) and of Oliver (5), both of whom independently used what Sewall describes as a "spring blood pressure gauge." By this method pressure is exerted on a superficial vein which is then milked toward the heart. The pressure is slowly released until the milked portion is seen to fill. At this instant the pressure is read off by noting the tension of a spring previously calibrated against mercury. The figures reported by Sewall for normal individuals agree quite well with our own. Still the difficulty of calibration and the likelihood of mechanically raising the venous pressure distally open up possibilities of criticism of a serious nature.

Our interest in the determination of venous pressure in man was aroused by an article of v. Recklinghausen (6), published in October, 1906, in which he described a new method of determinating venous pressure based on the one employed by v. Basch. v. Recklinghausen employed a small, flat rubber bag which consisted of two circular, thin rubber sheets, with central openings, fastened together at their edges; into this bag a rubber tube entered at the side. By this tube the bag is connected with a manometer and a pump for forcing air into the bag. The bag is laid over the vein to be investigated and the upper opening covered with a glass plate, through which, and through the opening on the opposite side, the vein can be seen. Glycerine is used to make

the rubber adhere to the skin and to the plate. Holding the glass plate between the fingers of one hand, air is foreed into the bag by means of the pump until the vein is seen to collapse, at which instant an assistant reads off the pressure in the manometer. In this paper also v. Recklinghausen called attention to the importance of having some point on the body to which all pressures could be referred and he chose the midpoint of the anterior-posterior diameter of the body at the sub-eostal angle. This is about the loeation of the right auricle in all positions of the body and is conveniently determined under varying conditions. It will be evident in the following description of our instrument that both in principle and mode of employment it is essentially only a modification of the one used by v. Reeklinghausen.

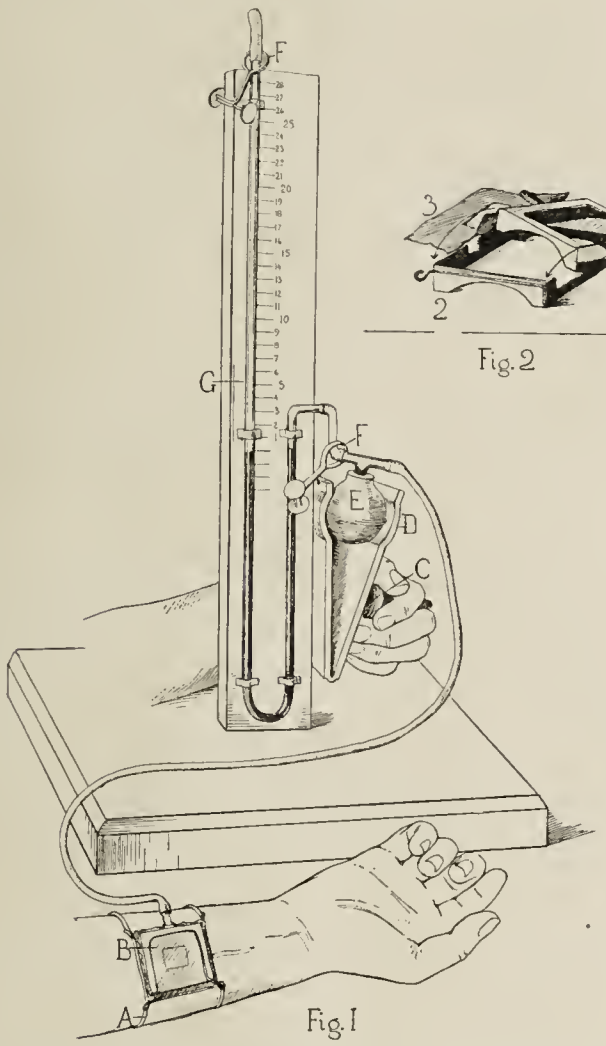


Fig. I

Fig. 2

Figure 1 shows the instrument in position ready for use. The box *B*, is held in position by the tapes *A*, so that the vein is visible through the rectangular opening in the thin rubber covering the bottom. The box is conneeted with the water manometer *G*, by a rubber tube, from whieh a T-tube enters the rubber bulb *E*. When the bulb *E*, is compressed between the plates *D*, by the coarse thumb-screw *C*, air is foreed into the box *B*, exerting a pressure on the vein lying exposed beneath. This pressure is transmitted directly to the manometer *G*, and may be read off in centimeters of water on the aecompanying seale. The actual pressure is, of course, represented by the difference in height of the water columns in the two arms of the manometer, or twice the distance travelled by the meniscus of one column from a zero read when the fluid in both arms is at the same level. The clips *F* are employed simply for convenience in transportation so that the water in the manometer may not spill out.

Fig. 2 shows the box *B* in greater detail. It consists of an aluminum frame *1*, cut away on two of its sides so as to fit the curve of the arm and to exert no pressure upon the vein investigated. One side and the top are made of glass, the former to permit light to fall upon the vein in such a way as to cause a good shadow to be cast and the latter to permit of an unobstructed view of the vein. The fourth side has a tube entering which conneets with manometer and rubber bulb. Over this frame fits the brass collar *2*, provided with the attachments for the binding tapes. The collar serves to hold the sheet of thin rubber dam *3*, over the bottom of the box. The advantage of this arrangement is simply that it allows the rubber to be renewed if occasion arises. To fit the parts of the box together the sides of the aluminum frame *1* are first covered with vaseline and the frame laid upon a smooth surface bottom up. The rubber sheet is then placed over it and fixed in position by pressing the brass collar gently into position. It remains then simply to cut off the excess rubber and to make the rectangular opening in the center.

In using the apparatus there are a few practical points which have to be born in mind. First, there must be no obstruction to the flow of blood to the heart. This is self-evident. We have found it most convenient to employ the veins of the baek of the hand or of the forearm, and if for any reason these are not distinet, lowering of the arm brings them out clearly. A good light is essential and it is advisable to have it so directed that a slight shadow is cast by the vein. The little rubber skirt is first covered with glycerine and the box then fastened in plaee by means of the tapes tied about the arm or hand. An area should be selected which is moderately flat so that the skirt may have a good chance to adhere to the skin. In fastening the box in position the tapes must not be drawn tightly, because, although the grooves in the box will keep the latter from pressing upon the vein, any tension of the tapes tends to stretch the skin which in turn presses slightly upon the vein. If now the pressure be raised by squeezing the bulb, the box is raised off the skin and at the same time the rubber skirt is pressed down tightly. This step is necessary to insure an air-tight compartment. We may now relieve the pressure, and after waiting a moment for conditions to become normal, proceed with our determination. It will be seen that as we slowly raise the pressure by squeezing the bulb between the brass plates there is an instant when the shadow suddenly disappears. If we maintain this pressure it will be noted in a moment that the vein again fills. This of course is due to the fact that the distal pressure has arisen and is able to overcome the outside pressure. It is important, therefore, that the readings be taken quickly. A very little practice makes it possible to read the pressures with such accuracy that the determinations vary within less than 1 em. of water. Having thus determined the pressure at which the vein collapses it is always advisable to determine as well the pressure at which it fills. This is done by lowering the pressure from a point above the venous pressure until the shadow again appears. When the latter readings are constant they will be found to differ from those obtained with the rising

pressure by about 2 cm. of water. The average of the two should be taken as the venous pressure. In order to insure the correctness of such a determination the hand should be raised or lowered a known distance and the readings again taken. These latter readings should, of course, differ from the former by the height of the hydrostatic column produced by the altered position of the arm. The accuracy of the determination being thus assured, it remains simply to measure the difference in height between the point of determination and the heart level as previously defined and to subtract or add it to the reading, and the result is the venous pressure at the heart level. This last procedure means merely that we have deducted or added a constant factor which is independent of the actual venous pressure.

That such determinations closely approximate the absolute pressure is indicated by experiments upon the exposed vein of a dog. A canula was placed in the facial vein close to the external jugular and connected with a water manometer. This manometer then registered the lateral pressure in the external jugular vein. The apparatus was applied to the latter vein centrally to the canula and readings taken. The following figures may serve as examples:

Lateral pressure ext. jug.....	4.5,	10,	13,	5.
Pressure read with instrument..	4,	10,	14,	5.

The variations in pressure here recorded were obtained by elevating the trunk of the animal. They serve merely to indicate the accuracy of the readings made with the instrument.

The correctness of the determinations of venous pressure made with the instrument being thus demonstrated, it is of interest to know what may be regarded as the venous pressure in normal individuals. Our study of the subject has not gone far enough to justify a definite conclusion. It is sufficient to state that (a) there is a normal variation of venous pressure in healthy subjects, and that (b) such variation, in our determinations, lies between 3 and 11 cm. of water. This statement is based upon the following observations:

(1) A study of the venous pressure of ten healthy men. The determinations were all made on June 2 with the subject in the sitting posture between the hours of eleven and one.

Further than this no attempt was made to control the experimental conditions; one subject had just ascended two flights of stairs, another had been sitting quietly for some time, etc., before the determinations were made. These varying factors may possibly have been the cause of the varying readings. The pressures, referred to the heart level, as above defined, were as follows:

Individual.....	G.	6 cm.
"	C.	4 "
"	M.	8.5 "
"	B.	9.5 "
"	E.	4 "
"	S.	4.5 "
"	Ch.	9 "
"	Bu.	9 "
"	J.	8.5 "
"	Go.	8 "

(2) A study of the venous pressure of two healthy individuals, the determinations being made at intervals of 10 minutes, throughout the greater part of the day. The results are given in the accompanying chart.

This chart shows what may be regarded as the normal variation in venous pressure. It will be noted that during moderate bodily activity the pressure in both subjects remained quite constant—about 8 cm. The apparent rise in pressure following psychical activity (visitor), and the fall following the use of tobacco require to be confirmed by repeated experiments before they may be regarded as of significance.

Of the ward cases which we have observed, the following are worthy of mention.

Case I.—D. H.; Med. No. 62,274. March 30, 1908. Middle-aged colored man with aortic and mitral insufficiency. He was dyspnœic and in considerable distress. The abdomen was swollen. The pulse was 80 per minute. The maximum arterial pressure was 150 mm. of mercury, the minimum 105 mm. of mercury, and the venous pressure 19 cm. of water. Four days later, on April 3, his dyspnœa had cleared up and he felt decidedly better. The pulse-rate and arterial pressures showed no change. The venous pressure had fallen to between 8 and 8.5 cm. On April 6 his general condition remained about the same. The pulse-rate had risen from 80 to 92 per minute. There was no change in the arterial pressures. The venous pressure was 9 cm.

This case shows a decided fall in the venous pressure as the condition of the patient improved. At the same time there was no change in the arterial pressures, while the pulse-rate was increased.

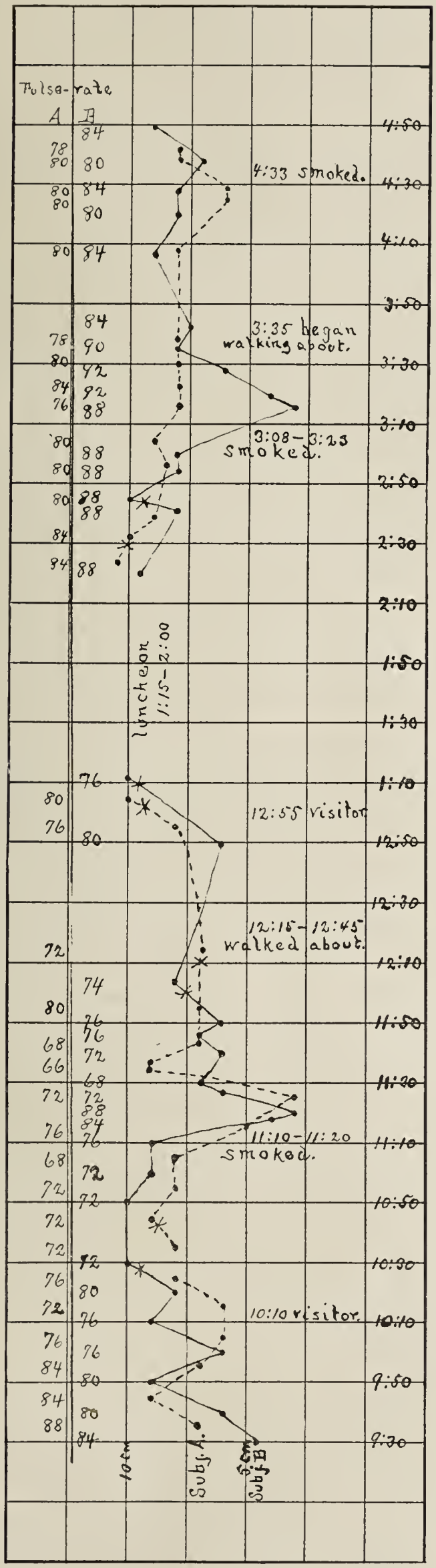
Case II.—A. B., Med. No. 63,235. White boy with acute endocarditis and pericarditis. Only two observations were made. At the first, on March 30, the patient was in considerable distress, irritable and coughed frequently. The venous pressure was 5.5-6 cm., the pulse-rate 130. On April 3 the venous pressure had risen to 12 cm. and the pulse-rate had fallen to 104. He was quiet and apparently quite comfortable. The cough had subsided. At the first observation the maximum arterial pressure was 110 mm., the minimum 85 mm.; at the second observation both pressures were 5 mm. lower.

This case contrasts with the first in showing a fall in pulse-rate accompanying the rise in venous pressure. The arterial pressures were practically unchanged.

Case III.—J. F.; Med. No. 62,742. Middle-aged white man with paroxysmal tachicardia. This case is of interest because we were able to make observations during an attack which occurred on April 5. On the days preceding the attack the venous pressure was 10.5 cm. During the attack this pressure varied between 16 and 21 cm. Before the attack the arterial pressures were, maximum 130-135 mm. and minimum 85 mm., with a pulse of about 75; during the attack the arterial pressures were maximum 120 mm.[1] and minimum 110 mm., with a pulse of about 220.

Case IV.—F. C.; Med No. 62,641. Middle-aged colored man with mitral insufficiency and stenosis. This case is the most interesting of our series. We first saw the patient March 26. He was reclining in bed and exhibited slight orthopnœa. Otherwise he appeared quite comfortable. The arterial pressures were, maximum 120 mm. and minimum 95 mm., the pulse-rate 108, and the venous pressure 11 cm. March 30 there was no marked change in his condition. The arterial pressures had risen to 140 mm. and

[1] The correctness of this determination may be questioned, owing to the very rapid heart-rate. It is, however, based on several readings.



Record of the determinations of venous pressure in two normal individuals, subject A and subject B, at intervals of ten minutes throughout the day (April 14, 1908). The abscissæ represent time, the ordinates venous pressure referred to the heart-level in centimeters of water. The notes below the curves give incidental factors. The figures above the curves indicate the determination of arterial pressures with the Erlanger sphygmomanometer as given in the accompanying table.

Time.	Subject A.			Subject B.		
	Syst.	Diast.	Pulse P.	Syst.	Diast.	Pulse P.
10:29.....	...	...	...	108	70	38
10:44..... ..	100	65	35	...	...	...
12:00.....	...	...	...	105	80–85	22
12:10.....	105	70	35	...	...	...
12:55.....	105	70	35	...	...	...
1:10.....	...	...	...	118	90	28
2:30.....	105	70	35	...	.	...
2:38.....	...	...	...	120	85	35

During the day, except when otherwise noted, the subjects were seated quietly.

120 mm., respectively; there was no change in either pulse-rate or venous pressure. April 3 there was more shortness of breath. The doctor in charge of the patient informed us that he had increased the amount of digitalis without effect. The arterial pressures and the pulse-rate were unchanged. The venous pressure had risen 7 cm. The day following, April 4, the patient appeared brighter and said he felt better. This improvement was probably due to the administration of morphia. The arterial pressures were unchanged. The pulse-rate had risen to 132 and the venous pressure to 26 cm., a rise of 15 cm. That night the patient's condition became critical and at 3 a. m. 200 cc. of blood were removed by venesection. April 5 the patient appeared very ill. The arterial pressures were, maximum 110 mm. and minimum 90-95 mm. The pulse-rate was 120 cm., the venous pressure 21 cm. From this time until April 15 he continually improved, the arterial pressures rose to 125 mm. and 105 mm., respectively, the pulse-rate fell to 112, and the venous pressure approximated its former level reaching 10 cm.

In this case the venous pressure alone appeared to give a true picture of the patient's condition. It rose with the onset of the attack and fell slowly as improvement set in following venesection.

The cases which we have reported suggest the possibility that determinations of venous pressure may be of considerable importance clinically.

There is one condition, which makes accurate determinations of venous pressure impossible, namely, phlebosclerosis. We have come across a number of cases, especially among colored men, which at first puzzled us considerably because of the unusually high venous pressure. It soon appeared that the veins were sclerotic and we were obliged to give up entirely all attempts to measure their venous pressure by the method here described.

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A FAMILY OF HEMERALOPES.

By James Bordley, Jr., M. D.,
Baltimore.

The confusion of the words *nyctalopia* and *hemeralopia* is so great that I deem an explanation of the title of this communication necessary. Ophthalmic literature, as well as the literature of medicine generally, is complicated by meaningless words and words with a dual meaning. We have several striking illustrations of the confusion resulting from the use of words, the definition of which is unsettled. Probably the most important example is the word *nyctalopia.*[1]

It occurs five times in the Hippocratic collection, and it is supposed that it really antedates these valuable writings, but of that there is no definite proof. Only once did Hippocrates offer any explanation of the word, and in that instance the literal translation of his idea is: "We call those nyctalopes who see by night." Eminent Greek scholars differ as to the etymology of the word, and we have a choice of two views. The two views coincide in that it is derived from two Greek words, νύξ and ὤψ, the one meaning the night, and the other, the eye. The letter *l,* which is the connecting-link between these two words, is the rock on which the authorities split. One set contends that it is intended as a privative, the other, that it is inserted simply for the sake of euphony.

Littré, who has made a most careful investigation, holds the latter, while Greenhill, another able and conscientious student, holds the former view. In favor of Littré's view that the word should be translated, "I see the night," are these facts: Hippocrates, who, so far as we know, first used the word, so defined it; the letter *l* is in no sense a privative; the word would lack euphony with the omission of the letter *l;* up to the seventeenth century *nyctalopia* was used to describe a periodic blindness; at that time the word *hemeralopia* was introduced; during the eighteenth and nineteenth centuries all the great scholars used *nyctalopia* to describe day-blindness and night-sight.

Greenhill, taking the word up etymologically, contends that it is quite clear that *l* is intended as a privative, though he acknowledges that a negative cannot be found in the definition in the original Greek. He calls this a copyist's error and points out that Galen, defining Hippocrates' meaning of the word, tells us, in no uncertain terms, that *nyctalopia* means "night-blindness." He contends that the evidence is complete when we take into consideration that Paulus Aegeneta, Actuarius, Aetius, Pliny, Nonius, and Varro all describe night-blindness and call it *nyctalopia.*

While Greenhill denies the authenticity of the manuscripts, he acknowledges that in two places in the Galen collection the word is used interchangeably for night-blindness and night-sight. Aetius describes a condition in which the person was blind by day and could see by night, and he calls it *nyctalopia.* Festus defines *nyctalopia* as night-sight and day-blindness. Celsus, describing night-blindness, avoids the word *nyctalopia* and speaks of the condition as "imbecillitas oculorum."

Tweedy upholds the view of Greenhill from a medical standpoint. His argument is certainly very ingenious, but could be used with equal force to uphold either view. For instance, he points out with Pliny that goat's milk and goat's liver were used by Hippocrates in treating the disease; he reasons that a goat can see by night, hence the treatment. As the goat has but little advantage over other animals, in fact, less power than many of seeing in the dark, I can hardly conceive of his treatment being based on that alone. Then as a goat can see with more facility in the day than in the night, those who hold, with Littré, the opposite view can use the same argument to prove their claim.

To-day, all of the great lexicographers grant that *hemeralopia* is the opposite of *nyctalopia,* and most of them favor the view that we should accept the literal translation and call a person who can see by night and is blind by day a *nyctalope.*

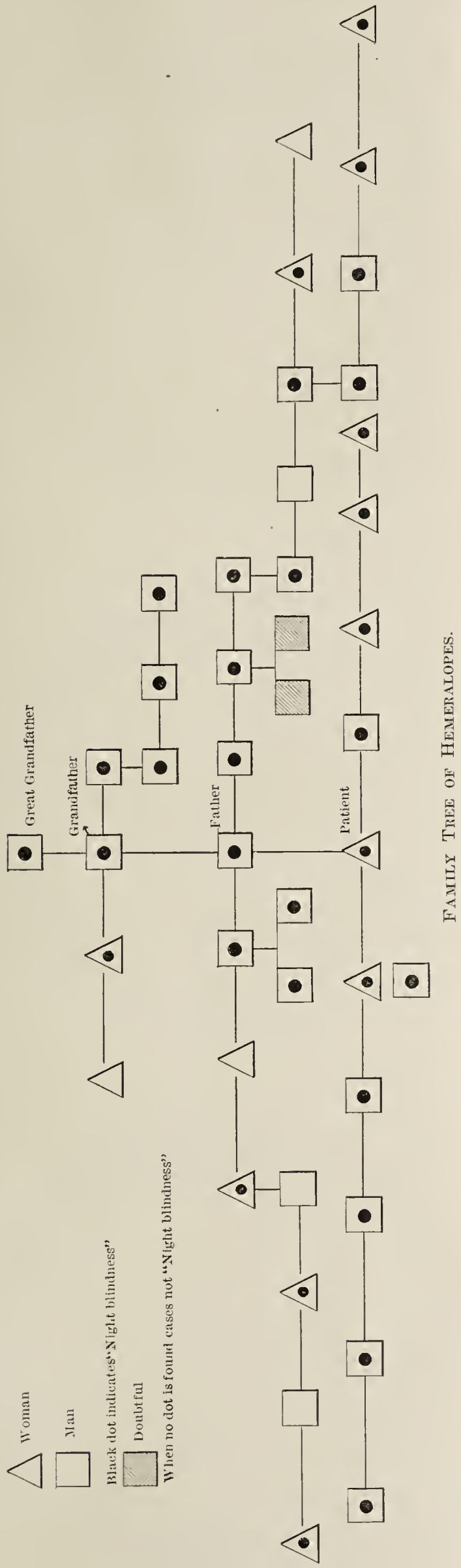
To briefly review, *nyctalopia* was primarily used to describe periodic blindness; during the ancient times its meaning was so confused as to describe both night-blindness and day-blindness. *Hemeralopia* was introduced (in one place only) into Greek nomenclature possibly to clear up this confusion; the word, however, never gained popularity until the seventeenth century, when an effort was made to separate the two conditions. *Nyctalopia* was then used in the sense of night-sight, such as that possessed by owls and bats.

Personally, I believe that both words are ill chosen, and I would substitute, for *nyctalopia,* night-sight, and for *hemeralopia* night-blindness. This would leave no doubt as to our meaning and it would free medical literature from one of its stumbling-blocks.

To go rather briefly into the discussion of *hemeralopia:* Fuchs writes, "This condition is not in itself a disease, but simply a symptom which may belong to various diseases." Changes in the media of the eye may bring about so radical a change in the refraction of light that when the pupil is dilated as the result of darkness the peripheral portions of the retina may be thrown out of use. Diseases of the peripheral portions of the retina, by lessening the sensibility of that organ, may so interfere with orientation, as to make the power of going about difficult or impossible when the retina is not stimulated by strong daylight. In Russia, this symptom, so called by Fuchs, is looked upon as an idiopathic disease.

Poverty aids this as it does all other human afflictions; the majority of our cases come from the poorer classes. That poor food and the lack of nitrogenous foodstuffs play an im-

[1] Hemiopia and hemianopia are words used to describe the same condition. Correctly defined they hold a diametrically opposite relation.



FAMILY TREE OF HEMERALOPES.

portant part is clearly illustrated by the fact that in Russia, during the long Easter fasts, when no meat is taken, the disease nearly always appears in an epidemic form.

The most interesting communication on this unusual condition is that of Kubli. He reports that in one hospital, in five years, there were 320 such cases. He found males more prone to the disease than females. Youth predisposes to the disease, for out of 200 cases of men, 122 were under 30 years of age and only 17 between the ages of 50 and 70 years. The only therapeutic measure of any avail in the treatment of these Russians was the resumption of a nourishing diet. The alteration in vision he attributed to an anæmia of the retina, due to the impaired quality of the blood.

We also find *hemeralopia* more common when the retina is exposed to strong light: sailors in the tropics, negroes in the cotton fields, men working along the water fronts; spring, with its bright sun, is the season when *hemeralopia* makes its appearance most often.

In 1754, Dr. Samuel Pye, of England, reported a case of so-called *nyctalopia,* by which he meant *hemeralopia,* in which he recognized the intermittent nature of the symptom. Being thoroughly convinced that the trouble belonged to that class of disease then know as intermittents, he denied himself the pleasure of bleeding from the jugular and ordered instead a decoction of "the bark." Under this treatment the night-blindness disappeared, and the patient was freed from the troublesome symptom for a year, when it returned, and the patient was again relieved by a second course of "the bark." This is the first instance that I can find in medical literature of a case of night-blindness probably the direct result of malarial infection. Since then a large number of cases have been laid to the score of the Plasmodium malariæ.

From this we see that there is no one cause for night-blindness, unless we regard a lack of sensibility on the part of the retina as the primary and all others as secondary causes. That debilitating diseases render the retina less sensitive is quite clear; that sudden stimulation of the retina results in a later period of anæsthesia is easily demonstrated; we cannot question that the selective action of certain toxins for the retina renders it less sensitive, causing a diminution in vision which is accentuated by the lesser stimulation of darkness. Still other cases exist in which we find no exciting cause, and to this class these thirty-five cases which I have had the opportunity to investigate belong. In these people there is absolutely no doubt that at night the retinal impression is not strong enough to produce a true mental registration; whether the failure to register is primarily due to weak chemical reaction on the part of the visual purple, or whether the nutrition of the nerve-cells is so much below par as to make them insensible to weak stimulation, or whether the nerve-conducting fibers are imperfectly developed and a "high tension current" is necessary to produce perfect conduction, or whether the higher centers are lacking in some essential element or elements necessary to a true interpretation of all visual impressions, is a matter beyond my knowledge. Many cases that have been reported seem clearly the result of lessened chemical action,

a sudden destruction of visual purple by intense light, followed by a secondary period of blindness when the light is withdrawn; others are as clearly the result of interference in nerve conduction as we see in certain cases of retrobulbar neuritis. My own cases suggest some congenital brain defect as in part at least responsible for the remarkable difference between day- and night-sight.

The family tree is to me most interesting. Representing as it does five generations, it shows that the disease is clearly one of inheritance. The whole family is not afflicted, but every case that has demonstrable night-blindness is the child of a parent who is a hemeralope. (There is no record of a member of the family with normal sight having had any children.) It is curious to note the close family likeness between members of this large negro family; they are all below normal height; very muscular, with black eyes and skin; intensely ignorant; a very interesting family characteristic and one that singles them out as unusual people in their race, is that they are prodigious workers; they have very broad foreheads with practically straight skulls on the posterior surface—dolichocephalic.

No exhaustive physical examination was undertaken to determine the condition of the various organs of the individual members of the family, but, from their general appearance and powers of endurance I felt sure that no organ, either in the thorax or abdomen, could have been seriously affected. The blood and urine of a number were examined and found normal. The temporal arteries of even the children were very prominent and the radials were quite stiff. The blood pressure was not taken.

Ophthalmoscopic examination revealed nothing abnormal in the very young children, but showed a very pronounced arteriosclerosis in the older members of the family. The retinæ were free from pigmentary disturbances and the papillæ showed no evidences of antecedent or present inflammations. Except for the rather early vascular changes, I consider the fundi of all those viewed by me as perfectly normal. Vision in good daylight, I found, as a rule, practically normal; the range was certainly no wider than a similar number of unselected cases would show. One man was myopic (2 *D* each eye).

Muscle balance showed only the usual variations; none of the family had strabismus or nystagmus.

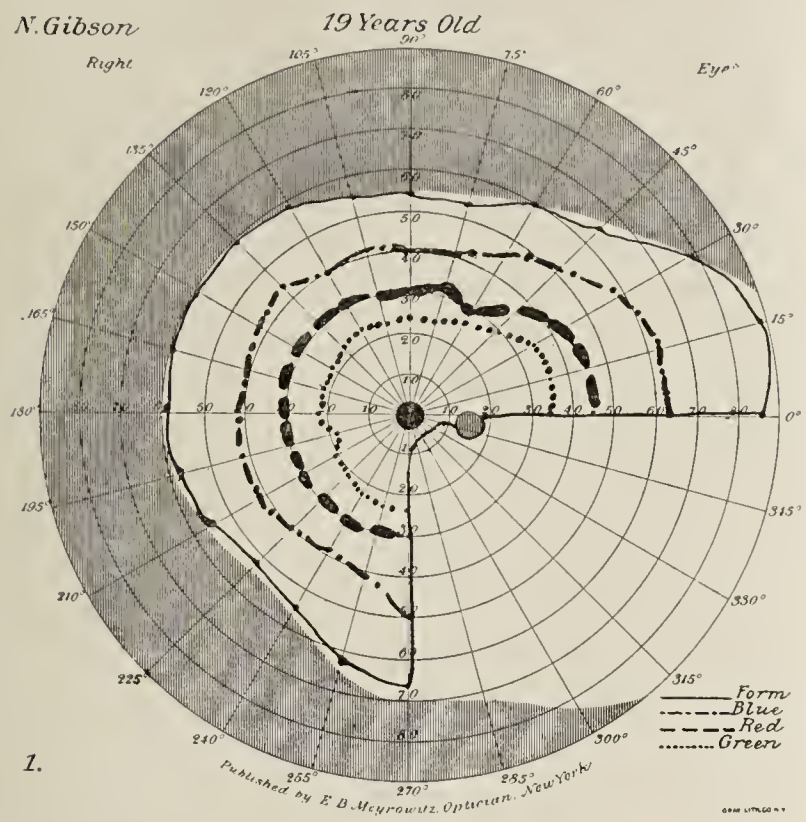
The fields of vision were very curious. I examined perimetrically seven members of the family, selecting different ages and different branches. In every case I found a complete loss of the outer lower quadrants of both fields. These scotomata were absolute and did not encroach on the central portion of the fields. Passing from the perimetric measurements in a boy of nineteen to those of a man fifty-two years of age, I found a gradual closing in of the fields, with the greatest change comparatively for form. I was interested to see how the form-line slipped down on the blue and the blue almost corresponded to the red. In the oldest case (fifty-two years of age), green was entirely lost, but not so blue and red.

There is a conspicuous difference between the fields which represent age and those which represent various intensities of light. In the latter the color change clearly exceeds that for form. Red, which resists most the ravages of age, is first to show the effects of diminished illumination, and with green early passes off the chart. As the light is diminished more and more, the field rapidly contracts until there is but a small central area for form showing no colors. I had my own field used as a control, and when these patients could see with only a small central area there was but a slight diminution in the size of my form field and a large color area left.

As the daylight grows more and more dim, the visual fields become more and more contracted. When the sun sets these people have to cease work. Artificial light, with its intense shadows, is little help, except when the individual is working in its direct glare. Walking after night on the street, these people stumble over ordinary lamp-posts with the lights set at their brightest. They stumble over large obstructions and walk into buildings exactly as an ordinary blind person would do. They lose the power of orientation from the enormous contraction of their visual fields.

As these people grow older their visual fields, even in bright daylight, become more and more constricted, until finally they become totally blind. Shortly after they lose their sight they die. Indeed total blindness is looked upon in the family as an infallible sign of impending dissolution. (Not one has lived over sixteen months after becoming blind.) After blindness ensues, the corneæ ulcerate and the eyes become infected and are lost. (Corneal ulceration in the night-blind is mentioned in the text-books and is accounted for by lack of nutrition due to poor circulation.) I had the opportunity of watching the process in one case: The father of my original patient had in the left eye a loss of epithelium associated with complete anæsthesia of the cornea and the portion of that side of the face supplied by the trigeminus. The portion of the cornea denuded of its epithelium became infected by pyogenic organisms, the cornea melted away and a general panophthalmitis ensued. Later the right side of the face and cornea became anæsthetic and the epithelium became denuded in two small areas. I put a Buller's shield over this eye and used irrigations of salt solution, and the corneal epithelium regenerated. At least in this one case the loss of the eye was due to trouble in the Gasserian ganglion or beyond. His death occurred in less than six months after the loss of his first eye; the cause was supposed to be apoplexy. He had a right-sided hemiplegia for two days before his death. A post mortem examination was not allowed.

While I can offer no explanation for the cause of this family ailment, I am convinced that the trouble does not lie alone in the photo-chemical apparatus of the retina. The loss, in every case examined for it, of the outer lower quadrants of the visual fields, the progressive nature of the disease, the association of blindness and death, the failure, in the only case watched, on the part of the trigeminus to function properly, to my mind indicates some inherited brain defect of a progressive nature. If we couple with these conditions the fact that the ophthalmoscope revealed nothing abnormal, the evidence is certainly strong against the theory that this family of night-blind people are suffering merely from a lack of visual purple.



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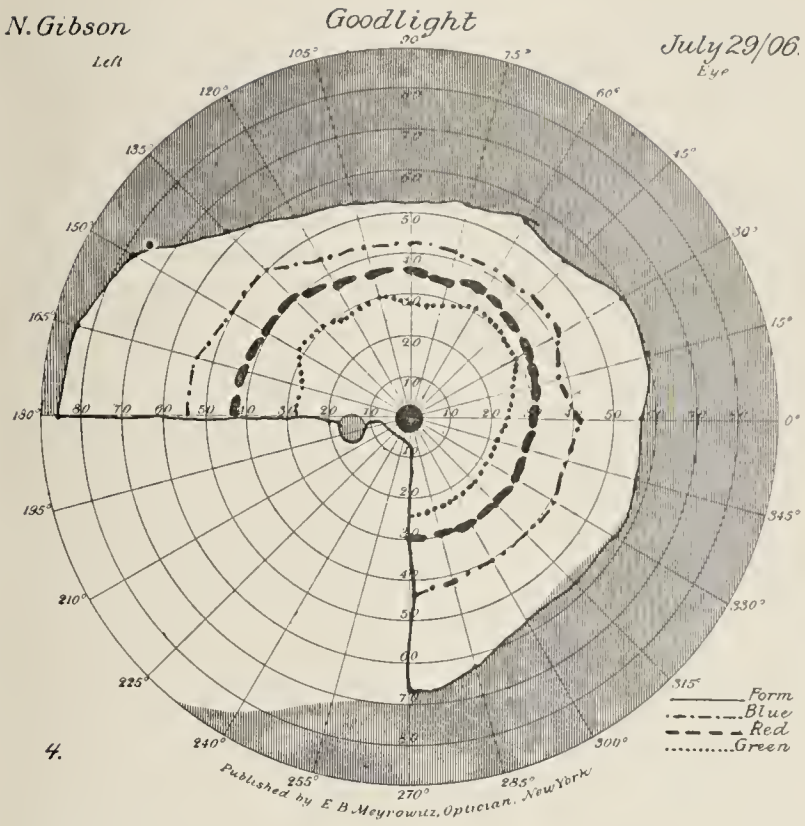

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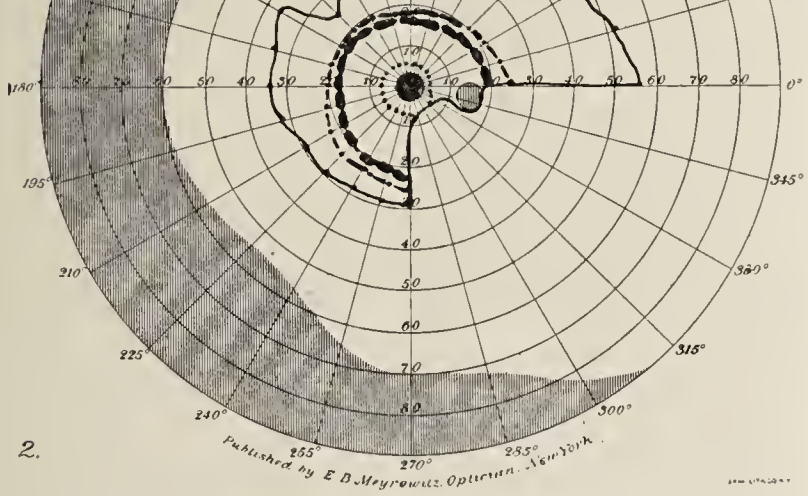

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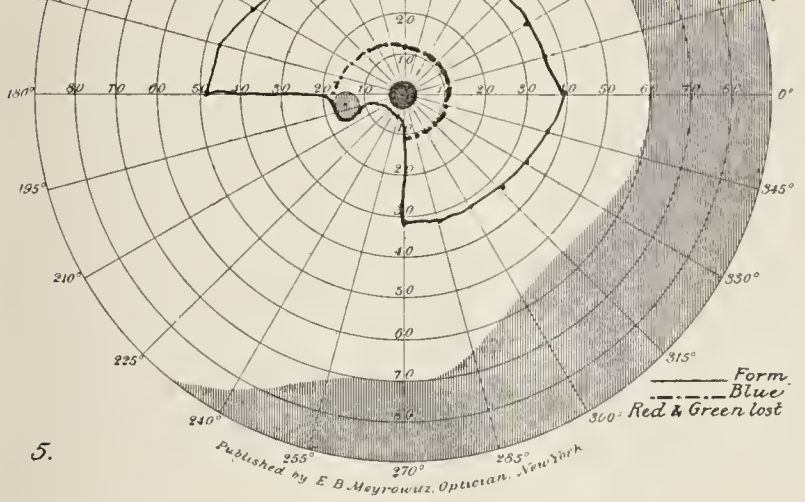

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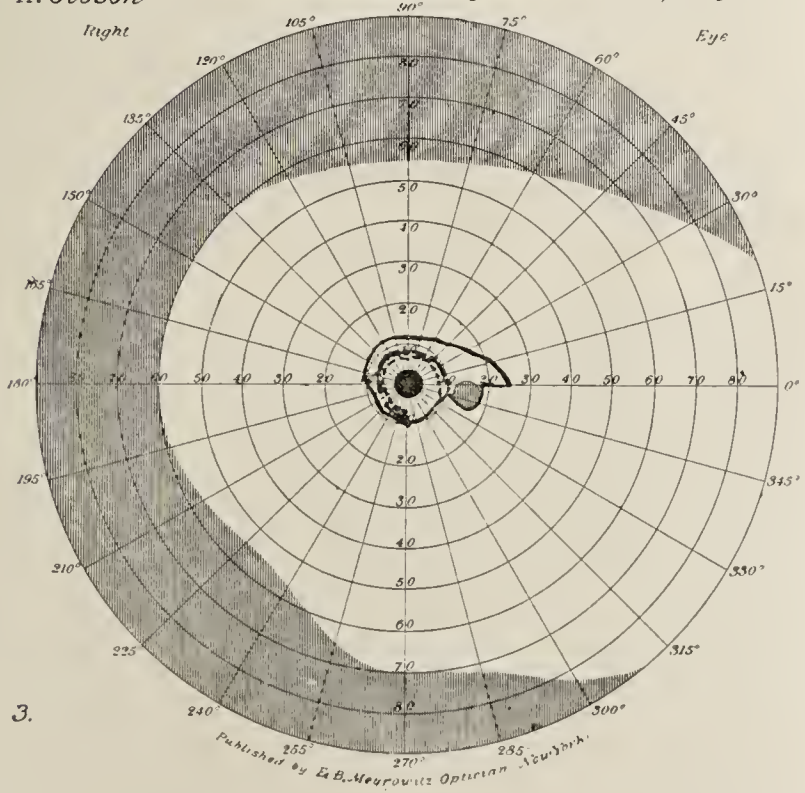

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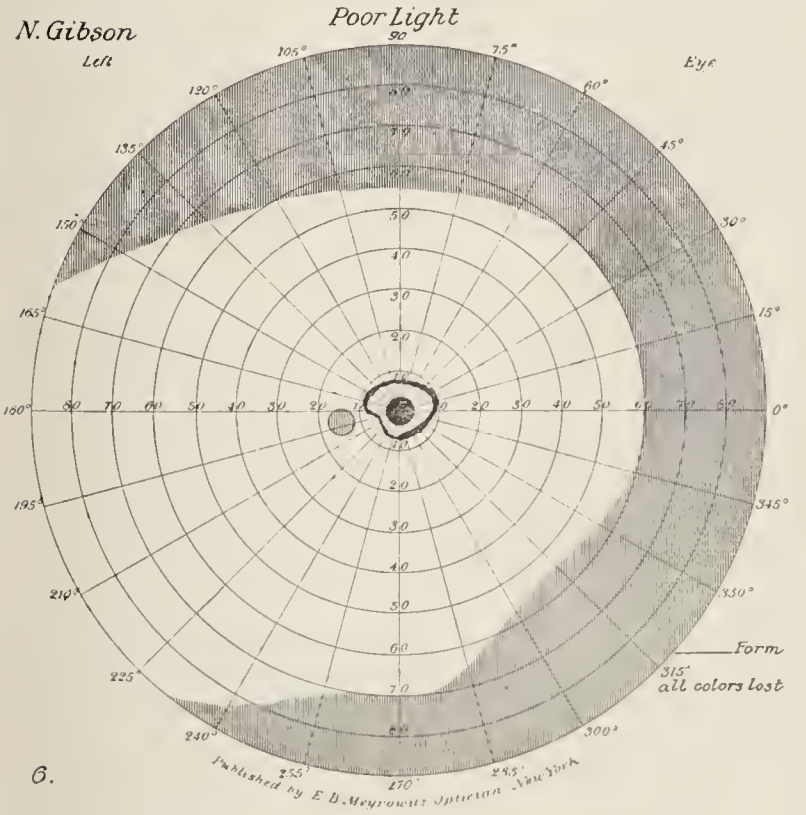

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TO ILLUSTRATE DR. BORDLEY'S PAPER.

NOTES AND NEWS.

INDEX MEDICUS.

The following communication is published to draw the attention of the medical profession to the urgent necessity of subscribing in large numbers to the Index Medicus. It is to be regretted that the list of subscribers is so small as to make it necessary to raise the price of the work, which is however worth more than its cost to all scientific workers. It is strange that with the annually increasing numbers of men well-trained in scientific lines this publication should be so poorly supported. It may not be known to them that by writing to the librarian research work in the Army Medical Library will be done for them at small cost if they so desire. All users of the Index Medicus recognize the loss it was to them when the publication was suspended during two years, and will doubtless be ready to pay more for it now to prevent its suspension; but there should be a much larger annual list of subscribers for this is one of the most important medical publications which exists, and its value is recognized as well abroad as at home. Every medical society should subscribe to the Index Medicus even if it be necessary to cut down its subscription list to other medical publications. There is little doubt that it is rather ignorance of the value of the publication than lack of appreciation of it which accounts for the small number of subscribers. Even in a small medical library its use as a reference book is great, and saves needless loss of time in looking through long files of journals for any particular subject. Without it the literature of any medical question cannot be thoroughly studied.

Carnegie Institution of Washington, Washington, D. C.
June 22, 1908.

To Subscribers to the Index Medicus:

At a recent meeting of the Executive Committee of the Carnegie Institution of Washington, it was decided to continue the publication of the Index Medicus during 1909, at an increased subscription rate of $8.00 a volume. The edition of the volume will depend entirely upon the number of subscriptions, and you are accordingly requested to notify us if it is your purpose to become a subscriber to the Index Medicus for the year 1909.

During the last two years efforts have been made to increase the subscription list to this publication, in order that at its present subscription rate of $5.00 a volume, it might help to support itself to a greater extent than in the past. These efforts, however, have met with little success, and the expectation of the Institution that representatives of the medical profession generally would support the Index Medicus has not been realized.

Nevertheless, for those who use the journal, it is undoubtedly of great value, and the action indicated above has been taken with a view to rendering the Index Medicus available, for another year at least, to those who find it useful. At the same time, it is hoped that the present number of subscribers may not be greatly reduced, as such a reduction might render necessary a further increase in the subscription price in the future.

If, therefore, you desire to become a subscriber to the Index Medicus for 1909, will you not kindly fill out the enclosed form and return it to us? Only those who place their orders prior to the issue of the number for January, 1909, may be sure of procuring copies for the year.

All communications should be addressed to

Carnegie Institution of Washington,
Washington, D. C.

PHILADELPHIA ACADEMY OF SURGERY.

The Samuel D. Gross Prize—Fifteen Hundred Dollars.

Essays will be received in competition for the prize until January 1, 1910.

The conditions annexed by the testator are that the prize "Shall be awarded every five years to the writer of the best original essay, not exceeding one hundred and fifty printed pages, octavo, in length, illustrative of some subject in Surgical Pathology or Surgical Practice, founded upon original investigations, the candidates for the prize to be American citizens."

It is expressly stipulated that the competitor who receives the prize, shall publish his essay in book form, and that he shall deposit one copy of the work in the Samuel D. Gross Library of the Philadelphia Academy of Surgery, and that on the title page, it shall be stated that to the essay was awarded the Samuel D. Gross Prize of the Philadelphia Academy of Surgery.

The essays, which must be written by a single author in the English language, should be sent to the "Trustees of the Samuel D. Gross Prize of the Philadelphia Academy of Surgery, care of the College of Physicians, 219 S. 13th St., Philadelphia," on or before January 1, 1910.

Each essay must be typewritten, distinguished by a motto, and accompanied by a sealed envelope bearing the same motto, containing the name and address of the writer. No envelope will be opened except that which accompanies the successful essay.

The Committee will return the unsuccessful essays if reclaimed by their respective writers, or their agents within one year.

The Committee reserves the right to make no award if the essays submitted are not considered worthy of the prize.

William J. Taylor, M. D.,
Richard H. Harte, M. D.,
DeForest Willard, M. D.,
Trustees.

Philadelphia, June 15, 1908.

NOTES ON NEW BOOKS.

Insomnia and Nerve Strain. By Henry S. Upson, M. D., etc. (*New York and London: G. P. Putnam's Sons, 1908.*)

"A truth—four columns tottering,
The more with each successive brick, until
The key is added, then, foursquare and strong,
The world may rest on it."

This is the motto to the book. The "world" represents the whole theory of insanity; the "key" is an impacted molar or an alveolar abscess. In the whole gamut of psychiatry, from insomnia to dementia præcox and involutional insanity, the author has discovered various dental abnormalities, and has witnessed wonder-cures in many of them, from filling a cavity here, drawing a tooth there, and treating an abscess in another place. Occasionally, to be sure, a case remains "incomplete therapeutically." In multitudes of cases the patients complained of absolutely no symptoms referable to the teeth, yet a skiagraph and a little dental surgery resulted in cures. The psychoses in these cases are of course explained as "subconscious sensory reflexes."

Many puzzling manifestations of insanity are classified in this handbook of dental psychiatry. The impulsive acts of dementia

præcox are analogous to the movements of an irritated caterpillar; the phenomena of hysteria are explained on the ground of "unusual length and mobility of the glia cells"; acts of self-mutilation are understood as subconscious sensory reflexes from an impacted molar which had given rise to no local symptoms; the habit old people get of waking up early in the morning is a result of dental caries. By relieving this the aged shall no longer rise up at the voice of the bird.

We have had wandering uteri, eye-strain, hypertrophied clitorides, aberrant thyroids and impacted molars, as the causes of almost all the disorders of the mind. We await a treatise on "Ingrowing Toenails in the Etiology of Insanity." FARRAR.

Borderland Studies: Miscellaneous Addresses and Essays Pertaining to Medicine and the Medical Profession and their Relations to General Science and Thought. Vol. II. By GEORGE M. GOULD, M. D., author of a series of medical dictionaries. (*Philadelphia: P. Blakiston's Son & Co., 1012 Walnut St., 1908.*)

In a book of this character which involves much delving for material in out-of-the-way places and constructive literary ability, the versatile and accomplished author is seen at his best. The first paper on the "History of the House" is full of food for thought and deserves to be expanded into a volume. The story of the evolution of the modern dwelling from the tree-house and the bent saplings covered with brush or grain-stalks of primitive man is fascinatingly told and amply illustrated by numerous photo-engravings. It is interesting to know that the passage-way between the ox-house or stable and the fire-house or hall was originally a threshing-floor, and that our word "thresh-hold" comes from it; that "paper-hangings" are a modern substitute for the tapestries of the 13th and 14th centuries; that the "mantle-piece" was originally the space studded with hooks above the fire-place where mantles were dried; that the "window" was the wind-eye and at first was wholly for ventilation—these and many similar facts are well presented.

The chapter on the "History and Psychology of Words" is full of curious knowledge and interesting inference. That on "King Arthur's Medicine" throws a flood of light on the medicine and medical and surgical practice of the middle ages. The book, although a collection of articles which had been published elsewhere, deserves careful reading and a wide circulation.

Diseases of the Nose, Throat, and Ear, Medical and Surgical. By WILLIAM LINCOLN BALLENGER, M. D., Professor of Otology, Rhinology, and Laryngology in the College of Physicians and Surgeons, Department of Medicine, University of Illinois. Illustrated with 471 engravings and 16 plates. Price, $5.50. (*Philadelphia and New York: Lea and Febriger.*)

A really excellent book; in many respects the most satisfactory text-book on these combined topics that has yet appeared. All three subjects are brought fairly well up to date, most of the new things that have been approved by experience having been introduced; we miss some that we think should have received more consideration, but that is a matter of personal judgment. In the main, the author's advice is most practical and sound. His treatment of the newer work in rhinology is especially praiseworthy, and as that constitues a large part of the work in this general field to-day, it will be thoroughly appreciated by readers. The section devoted to direct methods of examining the larynx and trachea and the removal of foreign bodies from the respiratory tract is full and well illustrated. The chapter on tonsils and, especially the discourse on the manner and the necessity for their complete removal, if any operation is to be performed, should be read by every physician. One might differ with him as to slight details in the method of tonsillectomy, but the important part is the consideration of the pathology of the tonsil and the fact that when diseased it should be entirely removed and not simply played with by taking away fractional portions.

The illustrations are good and materially assist in explaining the text.

I have to make one serious criticism of the book; it needs to be gone over most carefully for a revision of its English—there are many errors in grammar that should have been detected in the proof-reading—and the size of the volume should be reduced—there is an enormous amount of repetition which could readily, and without any loss to the clearness, be avoided by some slight rearrangement of chapters. These defects can easily be corrected in a second edition, and I feel sure a second will be called for ere long, as, in spite of the large number of small faults and the repetition caused by misplacing of discussions of disputed points, the book is still an extremely good one.

Dr. Ballenger makes one mistake which I fear may cause a deal of trouble; his commendation of hydrozone. In several different places he prescribes this preparation and particularly recommends it. Now if there is any single proprietary preparation that has been shown up as fraudulent beyond all others, it is hydrozone. The *Journal of the American Medical Association* long ago exposed its preposterous claims and double dealing with the profession. It is never safe to give an endorsement to a strictly proprietary preparation; this one has already proven its unworthiness, and how in the world the author could have made such a mistake in a text-book is beyond my comprehension.

H. O. R.

Pharmacology, the Action and Uses of Drugs. By MAURICE VEJUX TYRODE, M. D., Instructor of Pharmacology in the Medical School of Harvard University. Price, $1.50. (*Philadelphia: P Blakiston's Son & Co., 1908.*)

This is not intended as an exhaustive work in pharmacology, but to serve as a text-book to the young student of medicine or the general practitioner. It is conveniently divided into four main parts, as follows: Part I. Drugs Whose Constitutional Action is in Greater Prominence. Part II. Ferments, Secretions, and Extracts of Animal Organs. Part III. Drugs Whose Local Action is Most in Evidence. Part IV. Drugs of Inorganic Origin. Part I is again divided into 25 sub-groups, as, ether and chloral; amylnitrite; morphine; ammonia, etc.; Part II into five, as digestive ferments; bile; adrenalin, etc.; Part III into seven, as skin-irritants; urinary antiseptics; vegetable purgatives, etc.; and Part IV into five, as oxidizing agents and free halogens; water, acids, and alkalies; neutral salts, etc. This division of subjects, as the volume has a good index, makes its use quick and easy. Throughout the context the important sections and words are in heavy print, or italicized so that the eye rapidly catches the essentials of each paragraph. This style of printing is not one to be entirely commended, but it does serve a useful purpose, and in these days of skurry and worry, relieves the tired mind of painstaking search, and in a book of reference may justly be used.

R. N.

Index Catalogue of Medical and Veterinary Zöology. Subjects: Trematoda and Trematode Diseases. By CHARLES WARDELL STILES and ALBERT HASSALL. Bull. No. 37. 401 pages. (*Washington: Hyg. Lab. U. S. Pub. Health and Mar. Hosp. Serv., 1908.*)

The appearance of the first part of the subject catalogue of medical and veterinary zöology is a cause of congratulation to the authors and the department under which it is published, as well as a great addition to the working apparatus of all interested in this important field.

Like the Author Catalogue by the same compilers it is an example of the very best in catalogue work and puts an immense and confused literature before the public in a way which will

greatly facilitate accurate reference and exact nomenclature. The field covered by this volume is of immense economic interest and also important to the medical man, particularly since the increased association with the Philippine Islands. Dr. Hassall's name is especially associated with this great group of trematode worms and he has made many valuable contributions to its study and classification.

This volume, as well as the Author Catalogue, should be in every medical library and all laboratories where diagnostic work is undertaken. T. R. B.

Right-handedness and Left-handedness, with Chapters Treating of the Writing Posture, the Rule of the Road, etc. By George M. Gould, M. D. (*Philadelphia and London: J. B. Lippincott Company, 1908.*)

This little volume is composed of eight chapters, each previously published as a separate article in some medical journal or the *Popular Science Monthly.* They are here collected and arranged in sequence according to their relationship to the subject expressed in the first part of the title.

It is a very interesting book, like everything that Dr. Gould writes, and very logical in its conclusions. The author believes that the majority of mankind is right-eyed, that is, uses and depends mainly upon the right eye in preference to the left. That, largely in consequence of this fact, the right hand is by nature selected as the one of choice for all delicate manipulations. That to fight for ambidexterity is to oppose evolution, and sure to fail. Naturally the whole argument is hypothetical, and the effort to prove the matter by a study of the biological development of the human race is rather more interesting than convincing. It does not seem possible to prove the question definitely, so, we may accept Dr. Gould's reasoning as about as fair as anything that can be adduced on the subject. Certainly he appears to have given the matter a vast deal of serious consideration.

H. O. R.

International Clinics. Vol. II. Eighteenth Series. (*Philadelphia and London: J. B. Lippincott Company, 1908.*)

To its readers this volume brings its usual assortment of good papers by Americans and Europeans on treatment, medicine, surgery, etc. An article which will doubtless interest many practitioners is by Hallopean, one of the leading syphilographers of the world, on "The Treatment of Syphilis by Atoxyl"; this new drug supplies the profession with a valuable means of combating some very severe cases which are resistant to mercury and iodides. The volume contains other papers well worth reading.

R. N.

A Laboratory Manual of Invertebrate Zöology. Gilman A. Drew, Ph. D., Professor of Biology at the University of Maine, etc. With the aid of members of the Zöological Staff of Instructors of the Marine Biological Laboratory, Woods Holl, Mass. Price, $1.25. (*Philadelphia and London: W. B. Saunders Company, 1907.*)

This small book of 200 pages is a laboratory guide having for its basis the directions given by the staff of instructors of the class in zöology at the Marine Biological Laboratory at Woods Holl, Mass.

Full directions are given for the study of one or more examples of representative types, embracing the lower botanical and zöological forms. The author has not confined himself to the type method alone, but has endeavored to direct the attention of the student especially to the study of adaptation. In this he has been very successful. The book is not illustrated. The author evidently finds it of importance that all drawings should be made by the student from his own dissections.

It is probably the best working manual for students undertaking a systematic study of biology. It does not intend to be a text-book, and therefore is of little or no value to those who have not access to a well-equipped laboratory, or where both fresh and sea water forms cannot be obtained. Such accessories, however, are absolutely necessary for students to obtain a clear idea of present biological conceptions.

Electrical Treatment. By Wilfred Harris, M. D., F. R. C. P., etc. Illustrated. Price, $2.25. (*Chicago: W. T. Keener & Co., 1908.*)

For a variety of reasons this form of therapeutics does not receive by the profession at large the attention and use which seems its due. Probably many a young doctor feels that he does not know enough physics to use electricity intelligently; some who have a proper knowledge of electricity have not had a course in their medical career to teach them how to employ it beneficially; others find the installation of the necessary apparatus too expensive; and others are too lazy to help themselves and their patients with it, or sceptical as to its value, and quacks have used it in such ways as to give it a bad name. Many an expert neurologist does not aid himself in treating his patients with electricity as much as he might. None the less, electricity is often of distinct value, both in functional and organic diseases, and any one who is interested in the subject could do no better than to study this small volume carefully. The author, while an advocate of electricity in some form in many diseases, is none the less conservative in his estimate of it as a "cure-all," and his advice can be safely followed. He gives a full and careful description of the different currents and various machines required, and then shows to what troubles each form of current can best be applied. It is a pleasure to come across such an excellent work, and with its aid a young practitioner, who is ready to give the necessary time to electricity as a therapeutic agent, will doubtless be able to increase his practice. The publishers are to be complimented also on their production—the volume is neat in every respect.

R. N.

Studies from Institute for Medical Research, Fedcrated Malay States. Vol. III. Part 3. *Breeding Grounds of Culicidæ.* By C. W. Daniels, M. B., Camb., M. R. C. S. Eng. Director of the Institute for Medical Research, Federated Malay States. *The Culicidæ of Malaya.* By G. F. Leicester, M. B., C. M. Edin., Assistant in the Institute for Medical Research, Federated Malay States. Price 7/6. (*Singapore: Kelly & Walsh, Limited, Printers.*)

The authors of this work deserve great credit, for their labors have been of a most painstaking and tedious nature. It is an important addition to the history of the Culicidæ, but naturally will interest but a very small class of scientific workers. The reward of the authors must be their own satisfaction in a piece of work well done. "An appendix will be published later with a résumé of the classification together with the new names for all species described in the work referred to [Theobald's Monograph of the Culicidæ of the World]. The larval characters are not given, as it is hoped to issue a short description of these in a separate work." It is to be hoped that the writers who make this statement in their preface, will not be prevented from completing their valuable studies.

R. N.

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CONTENTS.

	PAGE
I. Sir John Harington. (Illustrated.) By J. George Adami, M. A., M. D., F. R. S.	285
II. The School of Montpellier. (Illustratcd.) By W. G. MacCallum, M. D.	296
III. Dr. Elisha North, One of Connecticut's most Eminent Medical Practitioners. (Illustrated). By Walter R. Steiner, M. D.	301
IV. The Psychiaters and Psychiatry of the Augustan Era. By Smith Ely Jelliffe, M. D.	308
V. Thomas Muffet, 1553–1604. By John Ruhrah, M. D.	312

I. SIR JOHN HARINGTON.[1]

By J. George Adami, M. A., M. D., F. R. S., Montreal.

F a truth it is with a certain amount of trepidation that I bring before you my subject this evening. It is a border land subject—on the border land of medicine, on the border land, some may even think, of the proprieties. My hero in the first place was unheroic: nor was he even a medical man: the main achievement through which he deserves to be remembered by medical men was what we now regard as a most commonplace matter of domestic hygiene: the work in which he announced his invention was not a sober scientific treatise, but, on the contrary, a squib of such questionable Elizabethan humor that Elizabeth herself instead of, as he delicately—or rather, indelicately—suggests, making him one of her Privy Council, banished him from court and he came perilously near prosecution by the Star Chamber. The subject may be said to savor of the unclean.

And yet, gentlemen, I protest that in making this almost apologetic preface I convict myself, and by implication you also, of a false modesty. The application of hydraulics to sanitation is as regards the welfare of the community a matter of the highest moment. There are things more inherently obscene which we write about and discuss freely in our medical societies without a thought of prudery: but this thing is so intimate a part of our every day life that it is difficult for us to separate its scientific from its every day aspect: we carry the feeling of "taboo"[2] with which custom and decency have invested it into the medical assembly. But if I am correctly informed there still exist districts in Baltimore in which it has not been installed, districts still burdened with back yard cess pools with, as a result, pollution of the air and an annual toll of infantile lives and enteric disease far above what ought to be. Here, therefore, it would still not be a work of supererogation to chant the praises of the water closet, or to trace the subject of the disposal of domestic ordure from ancient Nineveh with its well built shafts passing through the clay subsoil to the underlying porous sand; through Moses and his regulations for the camps of the children of Israel when in the wilderness,[3] and other biblical allusions—that "very fat man" Eglon, King of Moab, who was supposed to be "covering his feet" in his summer chamber when he was lying dead with the dagger of Ehud the Benjamite, deep within him:[4] or again the house of Baal that Jehu turned into a "draught house":[5] through Rome with its public latrines or *sellæ,* and cloacæ so abundant that parts of the city appeared to be built over close set water courses; through Pompeii with its *sterquilinia,* or

[1] Paper read before the Johns Hopkins Hospital Historical Club of Baltimore, April 13, 1908.

[2] As an illustration of this "taboo" I may note that the Encyclopedia Americana does not give it a heading or recognition.

[3] Deuteronomy, ch. 23, v. 12.

[4] Judges, ch. 13, v. 24; see also I Samuel, ch. 24, v. 3.

[5] II Kings, ch. 10, v. 27.

seats with running water beneath; down to the era of patents: to the first patent by Alexander Cumming in 1775 through Bramah, famous for hydraulic devices, infamous for his pan closet of 1778, down to Jennings and Doulton and Mott and the host of perfected forms of the present day. I might from the examples of Munich and other cities and their mortality and morbidity statistics trace the effects upon the well-being of the community of replacement of the abominable cess-pool by water disposal of ordure. Not that thereby I should teach you anything of which every one of you is not absolutely convinced already, but because possibly something of what I put before you might eventually filter down to the fathers of the city.

But I am going to do nothing of the kind.[6] All that I want to do is to impress upon you that the subject of this evening's paper, Sir John Harington, deserves to be held in memory by medical men as the inventor of the first apparatus in which the disposal of ordure by water carriage was controlled by mechanical means. It is difficult for us now-a-days to realize what an advance this indicated in not merely the comfort and decency but also in the health and well-being of the household. It was a notable advance that for years, not to say centuries, gave England the supremacy in domestic hygiene, even if during the last quarter of a century other civilized lands have made such rapid advance that now-a-days it may be questioned which actually leads. In France in 1750 it may be noted (my authority is Brockhaus' Konversations Lexikon) that water closets were known familiarly as "lieux à l'Anglaise" and even to the present day the English name for the apparatus, or the abbreviation of the same, is of international usage. Having said this, I want so far as possible to dismiss what I freely admit is not a congenial subject and to bring before you the inventor rather than his invention.

Some months ago I delivered an address upon an English provincial practitioner, Charles White, of Manchester, and Professor Welch writing to me about that article urged that it would be well for some one to take up other English provincial medical men of the eighteenth century, citing the able coteries of physicians and surgeons, not only in Manchester but also in such centers as Warrington (from which you at Johns Hopkins have recently obtained so interesting a medical library) and Bath. What I am about to place before you tonight is largely extracted from the work as I once thought—and still think, despite the Dictionary of National Biography—of a versatile Bath physician: of Henry Harington, M. A., M. D., physician in the first place, physician even to the Duke of York (that popular compound of Bishop of Osnaburg and Commander-in-Chief of the British Army), but yet more noted in his day and generation as a composer of glees, trios and other compositions sacred and profane, founder of the Bath Harmonic Society, Mayor of Bath, and author of a Geometrical Analogy of the Doctrine of the Trinity—in his versatility a worthy descendant of the subject of to-night's paper. Now it is quite true that the second volume of the first edition of the work in question—the Nugæ Antiquæ—published in 1775, is stated both on the title page and in the dedication to be compiled by Henry Harington, Junior, A. B., of Queen's College, Oxon. But the first and more important volume was published anonymously in 1769, when Henry Harington junior was but 14 years old. That a youth of 14 should not merely compile, but publish the family papers is highly improbable: nor during his father's lifetime would he be likely to have in his possession (as the editor of that first volume states upon page 4), so valuable a family heirloom as an engraved plate of her portrait (said to have been) given by the Princess Elizabeth to her attendant Isabella Harington in 1554. That first volume at least must have been compiled by or under the direction of the father, Dr. Harington. That this was so gains confirmation from the reproduction in it of an old melody by John Harington, Treasurer to the King's camps and buildings, which Henry VIII, Defender of the Faith and disperser of monks, used to sing when in a cheerful mood, being nothing less than the Black Sauntus, or Monks' "Hymn to Saunt Satane." The reproduction of this ancient canon would appeal to the mature musician of antiquarian tastes but scarce to a boy of 14.

The Harington Engraving of Queen Elizabeth. Reproduced from the original given as frontispiece to the first volume of the Nugæ Antiquæ, first edition.

The Nugæ Antiquæ is a delightful jumble of oddments from the family papers, over a period of more than three centuries—royal grants to Sir James Harington in the fifteenth century, verses by John Harington primus, tractates by Sir John Harington, letters to and from various members of the family connection, speeches of Queen Elizabeth and others, petitions of prisoners in the Tower, orders in Council, papers bearing upon parliamentary elections in the seventeenth century—all printed in no sort of order. For the miscellaneous nature of the contents an apology is made in the preface to the second volume. Several, it is stated, were met with on examining old family books of which the same leaf might contain on the one side a letter of political intelligence, on the other an excellent Ointment for Kibed Heels or a sovereign Balsam for Broken Shins.

[6] Those interested will find a sedate and quaint disquisition on the latrines and sewage disposal of the ancients in a rare piece of Oxoniana which Dr. Osler was so good as to put at my disposal: A Philosophical | Dialogue | concerning | Decency | to which is added | a Critical and Historical Dissertation on | Places of Retirement for necessary occasions | together | with an account of the Vessels and Utensils | in use among the Ancients | being a Lecture read | before a Society of learned Antiquarians | . . . . by the Author | of the Dissertation on Barley Wine | London | Printed for James Fletcher in the Ture, Oxford; and sold | by J. and J. Rivington in St. Paul's church yard, London | MDCCLI. 4to. pp. 48.

The author was Archdeacon Rolstone, a Fellow of Merton College, Oxford. The work affords several examples of bizarre etymology and, with many wise, not a few remarkable deductions, as that the decadence of Rome dated from the time when it became the custom for the lasanophori to carry round silver and golden vessels at the feasts.

It was my good fortune to be led by a kindly fate, now long years ago, to enter at that Cambridge college which as its bright and particular stars claims John Milton and Charles Darwin. Their glory dims that of a galaxy of lesser lights of various virtues: John Leland the antiquary, Francis Quarles of the "Emblems," Paley of the "Evidences," C. S. Caverley of the inimitable "Verses and Translations," Walter Besant of the "Golden Butterfly"—to mention some of the more generally familiar names. It is a college that should be held in esteem here in Baltimore for to Johns Hopkins it gave Newall Martin. Now among these alumni was imputed Sir John Harington: indeed the latest biography, that in the Dictionary of National Biography, still so imputes him. Browsing, in my piety, among the works of these worthies I came across the Nugæ Antiquæ, and in this jumble the letters and papers bearing upon Sir John Harington revealed so spontaneous and entertaining a character that for long years I have delighted in him, and when your President invited me to speak before you, rather than select some more noted figure upon which to expatiate, it seemed to me that I should give you the greater delectation if I pictured him to you as he reveals himself in his writings. As I shall point out, this assignment of Harington to Christ's is a mistake, but it was as a Christ's man that I thus first learned to know him.[7]

There was in the service of King Henry VIII a certain John Harington, who occupied the minor but responsible[8] position of treasurer of the King's camps and buildings. He was of good family, though landless: the family estates at Exton, and the many manors in Lancashire, Yorkshire and Westmoreland granted to his ancestor, Sir James Harington, by Edward IV in 1465, in recognition of his having taken Henry VI captive, became forfeited through the said Sir James unwisely attaching himself to the wrong side at Bosworth Field. But he was a man of no mean culture and evidently a pretty courtier: he had been instructed in music under Master Tallis, the first English composer of note, some of whose chants are still in use in the Anglican service, and could on occasion weave a melody or turn a graceful verse—and these gifts commended him to the King who, in 1546, gave him in marriage his natural daughter Esther or Ethelreda (by Joanna Dyngley or Dobson), endowing her at the time with the forfeited monastic estates of Bath Priory in Somersetshire. This Ethelreda died within a few years without issue, leaving her lands to her husband, who now, Henry being dead, attached himself to one whom our Catholic friends would term another natural daughter of the King's, namely, to the Princess Elizabeth. To her he remained faithful during the gloomy days of Queen Mary, occupying his time by falling in love with one of her six gentlewomen, Isabella, daughter of Sir John Markham of Cotham, in the process composing some lover's ditties which, as Ellis remarks,[9] if rightly attributed to him, are for elegance of taste and artifice of style far in advance of contemporary effusions. The two were married in time to accompany their mistress into captivity in the Tower in 1554, Harington being in addition fined £1000 for conveying correspondence between his mistress and her friends. It is little wonder, therefore, that Elizabeth held this trusty pair in particular esteem and transferred her affection to their son born in 1561, whose godmother she became.

And thus our hero was launched into the world with fortune smiling upon him. His childhood was spent at Stepney and Kelston, the family estate near Bath. He went to school at Eton, under the walls of Windsor. It was there that he made his first efforts in verse,[10] and while there Elizabeth sent to him in 1575 a very remarkable letter, which has not received, I think, the attention it deserves. "Boye Jacke," writes the Queen, "I have made a Clerke wryte faire my poore wordes for thyne use, as it cannote be such striplinges have entrance into Parliamente Assemblye as yet. Ponder theme in thy howres of leysure, and plaie wythe theme tyll they enter thyne understandinge; so shallt thou hereafter, perchance, fynde some good frutes hereof when thy god-mother is oute of remembraunce; and I do thys because thy father was readye to serve and love vs in trouble and thrall." Remembering the desire of her parliament and people that the question of succession should be settled, preferably by her marriage: remembering all that had passed in the previous years with one prince after another seeking her hand; remembering Leicester's present ascendancy[11] and the troubles to come, certain portions of this speech are very remarkable. "It cannot be denyed," says Elizabeth, "but worldlie wisdome rather bad me marry and knitt my selfe in league and alliaunce with great Princes, to purchase freendes on every side by worldlie meanes, and there repose the trust of myne assured strengthe, where force colde neuer want to giue assistaunce. Was I to lacke[12] in that which mans judgment owtwardlie must needs be thought the saffest course? Noe; I can neuer graunte my selfe to be soe simple, as not to see what all mens eyes discouered." And later she states plainly, "I wolde not forsake that poore and single state to matche with the greatest Monarche; not that I doe condemne the double knott, or judge amisse of suche as forced by necessi-

[7] Let me add that rejoicing over my discovery I wrote an article upon Harington in the College Magazine. That magazine was from its nature ephemeral: I doubt if it had a circulation of more than 200 copies. Add to this that the article has become doubly buried, now that we know that Harington had no relationship to Christ's College. I have therefore had no compunction in plagiarising myself and in using that previous shorter study as a basis for this.

[8] How responsible is suggested by the controverted episode of John Bradford the martyr. Bradford was at one time clerk under Harington: according to his biographers he exposed an attempted misappropriation by Harington of a large sum of money: according to Styrpe the historian, Bradford was the thief and Harington magnanimously covered his defalcations out of his own pocket. Apparently in those days as in these, "graft" was difficult to expose.

[9] "Specimens of the Early English Poets," 5th ed., 1845, p. 139.

[10] According to the "Apologie" prefacing his Orlando Furioso.

[11] This was the very year of Leicester's celebrated Masque, known to all readers of Kenilworth—fifteen years, it may be noted, after the death of Amy Robsart.

[12] The Nugæ gives this word as "seeke," but "lacke" affords the better sense.

tie, cannot dispose themeselves to another life; but wishe that none were drawen to chaunge, but suche as cannot keepe honest limitts. Yet, for yowr behalfe, there is no waie so difficulte, that maie towche my priuat person, which I will not well content my selffe to take. But let good heed be taken, that, in reaching too farr after future good, youe perill not the present and beginn to quarrell, and fall by dispute together by the eares, before it be deeyded whoe shall weare my Crowne . . . . I trust, God will not in suche haste cutt of my daies, but that, according to youre owne desart and my desier, I maie prouide some goode waie for your full securitie."

The more one ponders over this speech the more obvious it is that it contains the kernel of the poliey of the Virgin Queen. It was advantageous that she should seem ready to make possible alliances by marriage, now here, now there, in order to weaken alliances by force against her; but she was determined to remain single, save as a last resort.

From Eton he went up to Cambridge, certainly at first, as I learn from the Master of Christ's, to the Eton foundation of King's College,[13] apparently later to Trinity, for he speaks with the greatest respect of his relationship to Dr. Still, later Bishop of Bath and Wells, who was master of Trinity when Harington was at Cambridge. Writing 30 years later, he states that his tutor spoke of him as "the divine Still," and continues, "who when my selfe came to him to sue for my grace to be batehelour first he examined me strictly, and after answered me kindly that the grace he granted me was not of grace but of merit, who was often content to grace my young exercises with his venerable presence, who from that time to this hath given me some helpes, more hopes, all encouragements in my best studies. To whom I never came but I grew more religious; from whom I never went but I parted better instructed."[14] Reading Harington's account of the exemplary bishop it is impossible to believe that in his green salad days at Christ's he was—as popularly taught—the "Mr. S. Mr. of Art" who composed the second known English comedy, "Gammer Gurton's Needle." It is profane to attribute to him,

I love no roast but a nut brown toast
And a crab laid in the fire
A little bread shall do me stead,
Much bread I do not desire
No frost, nor snow, nor wind, I trow
Can hurt me if I wold.
I am so wrapped and thoroughly lapped
In jolly good ale and old.

With its rollicking chorus

Back and side go bare, go bare
Both foot and hand go cold
But belly, God send thee ale enough
Or be it new or old.

[13] This gains support from the references in the Apologie to his Orlando Furioso, already noted, to his tutor, "Samuel Flemming of King's College in Cambridge"; "a grave and learned man, one of very austere life."

[14] Nugæ Antiquæ, 1st ed., Vol. I, p. 22.

and its intimate appreciation of the alcoholic anorexia:

I cannot eat but little meat,
My stomach is not good,
But sure I think that I can drink
With him that wears a hood.

The present indications are that "Gammer Gurton's Needle" was first performed at Christ's College in 1559 and that "Mr. S." was a Mr. Stevenson.[15] It is interesting that Still's connection with the College (he began his Cambridge career there) and Harington's praise of him were the cause of the latter's being regarded until the last few years as an alumnus of Christ's. Volume IX of the new series of "Notes and Queries" gives a list of a rich collection of Elizabethan plays which were in Harington's library—so abounding in Shakespeare's separate dramas as to make the mouth water. It is obvious thus that Harington was keenly interested in the stage, and when at the same time he had so keen an enjoyment of gossip about the Elizabethan bishops,[16] it is scaree likely that he would have made no reference to Bishop Still's dramatie adventure had there been any such.

His career in Cambridge was evidently being watched with interest, for in June, 1578 the great Lord Treasurer Burghley writes from court to "my good Jacke," thanking young Harington for his letters, "which I lik not for the praise thei giue me, but for the promise thei make me; that is, that you will continewe in your endevour to gett vnderstandinge, without the which a man is lytle aecompted of, and, in deed, can not tell truelie how to aceompt of him self." The letter is a long and excellent essay upon the obtaining of knowledge, with a strong recommendation not to skip lectures. "For at a good lecture youe maie lerne, in an houre that (which) a good Teacher, perhapps, hath bene studyinge for a daie, and yourself, by readinge, shall not fynd oute in a moneth." And the letter ends, "Your fathers frende that loves you." But all this excellent advice did not prevent young Harington running into debt at the University and finding it necessary to write to an old friend of the family to intercede with his father to pay what was owing.

From Cambridge Harington went up to London and entered at Lincoln's Inn[17] to study the law, but of that law we hear little: the court had greater attractions.

There is something of the morning of life about the Elizabethans. Above them towers the good solid Lord Treasurer Burghley, whom everybody trusted, full of the responsibilities of state, and rejoicing in faithful statecraft: he forms, as it were, the steady *bourdon* to the abundant fresh melody

[15] Will. Stephenson, a Bachelor Fellow, superintended the College Plays in 1550 to 1553. He also made "songs for the quere." He was subsequently Prebendary of Durham. Will Stevenson (sic) is also recorded as Fellow in 1559 and 1561. Dr. Peile suggests that he is the same man re-elected after Mary's death (see Cambridge College Histories—Christ's College, by J. Peile, Litt. D., Master of the College, pp. 54 and 73).

[16] He wrote for Prince Henry a most entertaining account of the state of the church in the Elizabethan era.

[17] In the "Metamorphosis" he describes himself as having been "a punie (puisne) of Lincoln's Inn."

of the time. His very sureness seems to have left it to all, or almost all the rest whom we know and admire, to conduct themselves like youthful giants, rejoicing in their strength, with a sense of power to undertake anything and everything, God's sunshine in their hearts and a "joie de vivre" that no succeeding generation has attained unto. To me Harington presents himself as the quintessence of that freshness and spontaneity with, it must be acknowledged, an exaggerated irresponsibility, the irresponsibility of the spoiled child of fortune. But he was not the mere butterfly courtier: with all his lightheartedness he was a keen observer, a steady student, an omnivorous reader, familiar with many languages. It is true that he was neither great nor glorious. Those living at courts do too often but minister to greatness: too often their glory is but reflected: nevertheless, the little that Harington has left behind him, most of it written without thought of publication, is of so admirable a quality that the reader cannot but wish that he had left more such excellent material to posterity.

Rapidly he appears to have established himself as a ready wit, a master of repartee and of epigram, there being included under that term not merely the epigram proper with the sting in its tail, but what we would now regard as occasional verse—*vers de societé*. A considerable collection of these verses was published after his death, the fullest being in the third edition of the Orlando Furioso (1634): there is a Ms. collection of other verse in his handwriting in a copy of the Orlando Furioso in the Cambridge University Library, which had belonged to his mother-in-law, Lady Rogers. Two at least of the epigrams are widely known although not always correctly attributed. There is first his rendering of Martial's epigram:

> The goodly haire that Galla weares
> Is hers; who would have thought it?
> She swears it is, and true she swears
> For I know where she bought it.

and next that brilliant

> Treason doth never prosper; what's the reason?
> Why; if it prosper, none dare call it Treason.

So also we come across memorable lines here and there in verses which as a whole are of little present interest. Such are,

> Books give not wisdom where was none before
> But where some is, there reading makes it more.

And those opening lines of an address to his wife when they had been married 14 years:

> "Two prentiships with thee I now have been,
> Mad times, sad times, glad times our life hath seen."

Equally happy are such as the following address:

To the Queen's Majestie.

> For ever dear, for ever dreaded Prince,
> You read a verse of mine a little since,
> And so pronounced each word and every letter,
> Your gracious reading graced my verse the better.
> Sith then your Highness doth, by gift exceeding
> Make what you read the better for your reading
> Let my poor muse your pains thus farre importune
> Like as you read my verse so—read my Fortune.

This last he signs "From your Highnesse' saucy Godson," and copies into his "Breefe Notes."[18] He prefaces it there with the following remark: "(Essex) bids me lay goode holde on her Majestie's bountie, and ask freely. I will attende tomorrow, and leave this little poesie behind her cushion at my departing from her presence." In the same "Breefe Notes and Remembrances" is to be found this jotting: "The Qucene stoode up and bade me reache forth my arme to rest her thereon. Oh, what swete burden for my next songe! Petrarcke shall eke out good matter for this business."

We hear nothing of Harington during the stirring times of the Armada, nor does he seem to have taken part in any of the continental expeditions of the years following its overthrow: nor again did a parliamentary career have any interest for him. Elizabeth in fact would seem to have acquired at most respect but little love for her parliament, nor would she willingly have seen her godson a member of that assembly.

He seems in short to have been one of those men of talent who wasted themselves in constant dallying around a fitful queen: a queen who nevertheless with all her fitfulness possessed to a remarkable degree the power of preserving the affection of her subjects, nay, more, of attracting and binding to herself the ablest among them and of guiding the ship of state aright. As the younger Cecil writes to Harington after her death[19] she was "more than a man and in troth, sometyme less than a woman," and as Harington himself describes her: "When she smiled it was a pure sunshine that every one did chuse to baske in, if they could, but anon came a storm from a sudden gathering of clouds, and the thunder fell in wondrous manner on all alike. I never did fynde greater show of understandinge and lerninge than she was bleste with."[20]

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[18] These "Breefe Notes" are given in the 1804 reprint, edited by T. Park, F. S. A., but not in the first edition of the Nugæ.

[19] Letter from Sir Robert Cecil to Harington, 1603.

[20] This is but the concluding portion of a very full study of Elizabeth's character in a letter to his cousin, Robert Markham, in 1606. It begins: "I marvell to thynke what strange humors do conspire to patch up the natures of some myndes. The elements do seem to strive which shall conquer and rise above the other. In good soothe, our late Queen did enfolde them all together . . . . Hir mynde was oftime like the gentle aire that comethe from the westerly pointe in a summers morn; twas sweete and refreshinge to all arounde her. Her speech did winne all affections, and hir subjects did trye to shewe all love to hir commandes; for she would saye hir state did require her to commande what she knew hir people woude willingely do from their owne love to hir. Herein did she showe hir wysdome fullie; for, Who did chuse to lose hir confidence; or Who woude wythholde a shewe of love and obedience when their Souereign said it was their own choice and not hir compulsion? Surely she did plaie well hir tables to gain obedience thus wythout constraint; again she coud pute forthe suche alteracions, when obedience was

Thus it was that the brightest men of the time collected at her court, subjected themselves humbly to each outburst of her more-than-feminine irrationality and held themselves to have gained the object of highest ambition if perchance the Queen deigned to smile upon some well turned sonnet, or to receive with approval some choice euphuistic address wherein flattery was applied as it were the best butter laid on by a subtly wielded malt shovel.

What this court life was is evidenced throughout Harington's notes and correspondence: the pageants: the elaborate dress: the costly offerings that it was the custom to present to Elizabeth, with little return from this descendant of Henry VII: the rivalries and jealousies: the strange admixture of strong religious feeling and very open speaking: the queenly or rather unqueenly rebuffs, and withal something in that Queen that is royal and dominant and great. It was a strange court. Take for instance this little insight into its ways: "The queene loveth to see me in my last frize jerkin, and saithe 'tis well enoughe entt.' I will have another make liken to it. I do remember she spitt on Sir Matthew's fringed clothe, and said, 'the foole's wit was gone to ragges.' Heaven spare me from such jibinge."

Or again this piece of ineffectual self-communing: "In Augnst I was much troublede at sundrie grievences from divers menne in high state: but envie doth haunte manie and breed jealousie. I will bid adieu to good companie, and leave sueing and seeking at courte: for it I have no more frends at Heavens courte than at this I shall beginne to thinke somewhat of breefe damnation." And again in a similar strain regarding one of these men in high state: "I will write a damnable storie and put it in goodlie verse about Lord A. (? the Lord Admiral Howard, Earl of Nottingham). He hathe done me some ill turnes. God keepe us from lyinge and slander worke."

It must indeed be admitted that Harington was not the perfect courtier. He had too keen a sense of the humor of it all, and evidently, if we can draw any conclusions from his letters, a tongue too ready to express that sense of humor. No wonder if he shocked those to whom the pomp and pageantry of the court was a very real means to an end.

In 1584 Harington married the daughter of Sir George Rogers [21] of Cannington, one of his Somersetshire neighbors, and by her he had eight children. His married life, judging from the letters of husband and wife, was a happy one, although, as many an epigram shows, the mother-in-law, Lady Rogers, was a veritable thorn in the side. Marriage, however, did not mean neglect of court, although he now busied himself in building or rebuilding the house of Kelston and spent in the process more than he could well afford. The year 1691 saw the publication of his most considerable poetic effort. He had translated and circulated in manuscript the story of Giacondo from the XXVIIIth book of Orlando Furioso, and by chance this came to the notice of the Queen, who as a punishment for his having circulated among her ladies-in-waiting not the most creditable of Ariosto's tales, commanded his absence from court until he had translated the whole. It was a paradoxical punishment, nor is it perhaps surprising that the work shows sign of haste: nevertheless, it was very popular, passing through two editions during his lifetime and a third in 1634. Few, I think, in these novel-reading days, will find this interminable chain of tales and marvellous adventures anything but flat and insipid; but the versification is smooth and in general not forced, save in what is its main interest, namely, the use of the *terza rima,* which for all his cleverness Harington could not popularize: it is unsuited to the genius of the English language; it has an artificial effect. In the history of English printing the book has, if I am not mistaken, the distinction of being the first work illustrated throughout with copper engravings. The frontispiece from which the portrait of Harington is taken [21a] is signed by William Rogers, the first Englishman known to have practiced the art. To him, I doubt not, we owe the engraving of Elizabeth already referred to and reproduced.

In the following year the Queen, while on one of her royal progresses, paid him a visit at Kelston: that same year he was made High Sheriff of his county and now he may be said to have reached the hey-day of his prosperity. His new house besides costing him more than he could afford, and running him into the expense of a royal entertainment, contained that which, while it has brought him posthumous fame, was the cause of his temporary undoing. Briefly, to make that house more perfect he invented and installed a water closet, and in 1596 he described and illustrated his invention in pamphlet under the title, "A New Discourse Upon a stale Subject called the Metamorphosis of Ajax," [22] issued under the pseudonym of "Misacmos"; upon which came a succession of anonymous pamphlets—"Ulysses upon Ajax," "An Anatomie of the Metamorphosed Ajax," and "An Apologie (1), or Rather a Retraction (2), or Rather a Recantation (3), or Rather a Recapitulation . . . . (12), or Rather none of them."

I have looked through the first of these. What perhaps is its most striking feature is the wide and varied reading that it discloses; the power, somewhat akin to that of Sterne of later days, of recondite reference; the simultaneous parade

lackinge, as lefte no doubtynges whose daughter she was . . . . Sir Christopher Hatton was wont to saye the Queene did fishe for mens souls, and had so sweet a baite that no one coude escape hir network.

I have seen her smile, soothe with great semblance of good likinge, to all arounde, and cause everie one to open his moste inwarde thought to her; when on a sudden, she woud ponder in pryvate on what had passed, write down all their opinions, draw them out as occasion required, and sometyme disprove to their faces what had been delivered a month before. Hence she knew every ones parte, and by thus fishinge, as Hatton sayede, she caught many poor fishe, who little knew what snare was laid for them."

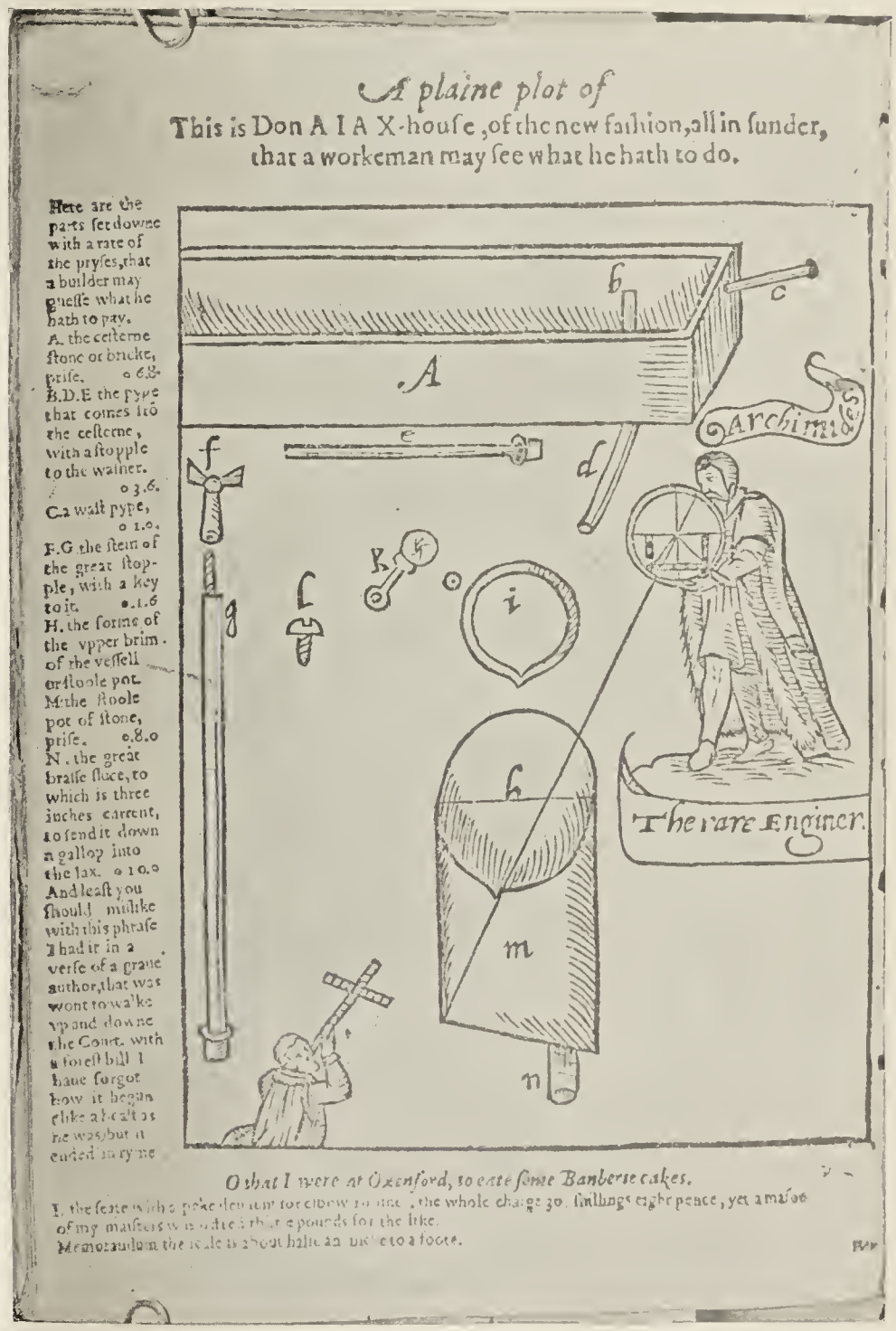
[21] Son of Sir Edward Rogers who was Elizabeth's first "comptroller of the household."

[21a] Given as an initial letter at the beginning of this paper.

[22] Ajax = a jakes.

and parody of scholarship. But I have to confess that it leaves the impression of rather poor wit. There is the inevitable quotation from Rabelais (or, as he is termed, Rables), but nothing that I can see broader or more indecent than was commonly both printed and to be heard and evidently enjoyed in the playhouses of the era. Most wit, it may be urged, is of the topical, allusive, type, and so is elusive to another generation or community: those on this continent, for example, cannot, in general, for this very cause, appreciate "Punch." I was horrified the other day, taking up what I remembered with delight and had regarded as an established classic, and beginning to read "Alice in Wonderland" to my youngster, to find how many of its good points were to him pointless. And that inevitably. He had had a different education from the ordinary English child: the parodies to him were merely nonsense verses: all their allusiveness and their main humor was as if it had never been; and so with many of the allusions to tags of school teaching, such as is doled out to English youth. Most of the quips, therefore, of the "Metamorphosis," doubtless fall flat upon the modern reader. But it would seem that the work was not in itself and for itself regarded as offensive, save for a suspected innuendo directed against the (second) Earl of Leicester. This it was that led to the danger of a Star Chamber prosecution, warded off through Elizabeth's instrumentality. Regarding the invention it may be noted that as indicated by the illustration, it consisted of a cistern with overflow pipe, a discharge pipe of generous dimensions, permitting a rapid and full flush, such as only within the last few years has again been recognized as essential, and a valve, a plug-like apparatus controlling the discharge. The Queen herself would seem, eventually if not throughout, to have taken the work in good spirit, and verses in the collection of 1634 indicate that she instructed that a water closet after Harington's design be installed in the palace at Richmond, and what is more, sent her thanks to Harington for the invention.[23] Nevertheless, it would seem that for months Harington deemed it advisable not to appear at court, and we hear little about him until the time of Essex's disastrous Irish campaign against Tyrone, in 1699, to which he was attached as master of horse under the Earl of Southampton, There are indications that prior to the ill-fated expedition Harington was known to and liked by Essex, although he cannot be said to have belonged to his faction. The government would seem to have thought it politic to have on the staff one firmly attached to the Queen's interests. From the instructions received prior to his departure it is evident that Essex was regarded with mistrust, not only by Sir Robert Cecil,[24] and the dominant court party, but even by Elizabeth herself. Harington was commanded to keep and forward to the Queen a full journal of all that he observed, and this was to be done with the utmost secrecy: further, influential friends wrote urging him to beware lest his relations with the Lord Deputy should appear too intimate: relatives, with the relatives' privilege of direct language, wrote urging him to keep a restraint upon his tongue lest "his damnable uncovered honesty should spoyle all."

But brilliantly as Essex had accomplished the cutting out at Cadiz, he was utterly unable to cope with the Irish



Working plan of the parts of Harington's water closet reproduced from a copy of the "Metamorphosis" in the Library of Trinity College, Cambridge. For this I am indebted to C. Sayle, Esq., of the Cambridge University Library. The accompanying figure showing the parts put together is of no particular merit.

methods of warfare. He was not a Cromwell. The campaign dragged itself along without any clear advantage accruing: slight successes here and there were more than counterbalanced by the defeat of small detached bodies of his troops, each defeat being more than magnified by Essex's detractors at home. The Lord Deputy's sole consolation would seem to have lain in the large indulgence in his prerogative,

[23] Thus the 44th Epigram is addressed to the Ladies of the Queen's Privy Chamber at Richmond, and accompanying it was "The Booke hanged in chaines" and the 52d is addressed "To the Queene when she was pacified and had sent Misacmos thanks for the invention."

[24] Second son of Lord Burghley, who was subsequently appointed Commissioner to try the Earl of Essex for leaving Ireland, and later made Earl of Salisbury by James I.

in knighting his officers. He created no less than 81 knights during the course of the inglorious campaign, and among them Harington received the doubtful honor.[25]

When in the autumn Essex completed a truce with Tyrone and rushed back to court, he took Harington with him, possibly with the idea that the Queen's godson might be able to secure him a favorable reception. If so, he was bitterly mistaken. With advancing age Elizabeth's temper was becoming more and more violent. The death of Burghley in 1598 had sorely tried her:[26] him she had trusted implicitly: no one could replace him: no one had like restraining influence upon her.

The Queen was in a fury with her Lord Deputy and the whole Irish business: Harington never forgot his reception that September, "When I did come into hir presence she chaffed much, walked fastly to and fro, looked with discomposure in her visage, and, I remember, catched my girdle when I kneelede to her, and swore, 'By God's Son, I am no Queen, that Man is above me; Who gave him commande to come here so soon? I did send hym on other busynesse."[27] She then bade Harington go home: he "did not stay to be bidden twise. If all the Iryshe rebles had been at my heeles, I should not have made better speede." After reading the journal which Harington had kept she swore they were all idle knaves, and the Lord Deputy worse, and she accused Harington of having gone for his knighthood.

Once more then Harington was in disfavor, this time from no fault of his own. Apparently judging from a letter to Sir Anthony Standen he ventured to court again in February, this time with a shade more success. "After I had been there but an hour, I was threatened with the Fleet; I answered poetically, that coming so late from the land-service I hoped I should not be prest to serve in her Majesty's fleet in Fleet-Street . . . . But I had this good fortune that, after four or five days, the Queen had talked of me and twice talked to me, though very briefly. At last she gave me a full and gracious audience in the Withdrawing chamber at Whitehall, where herself being accuser, judge and witness, I was cleared and graciously dismissed." But through the ensuing months of Essex's disgrace and rebellion he appears to have kept away from court, although characteristically shortly before the end he adventured to visit the prisoner in the Tower, once if not twice. His description of the fallen favorite is striking. "I was entrusted (by Essex) with a message to the Queen's Majestie setting forthe his contrition and sore grievance for his manie offences. I was righte glad to hear such contrition, but ere I coude beare these tydinges (which I was well advysede to do) the Earle's petition reached her hand and I fearcd her displeasure." And so he took no active steps. "I said Charitie did begin at home and shoud alwaies sayle with a fair winde, or it was not likelie to be a prosperous voyage . . . . I had nearly been wrecked on the Essex coast in my late venture, as I tolde the Queene." "I have heard much on bothe handes but the wiser is he who reporteth nothing hereof. In my last discourse he uttered strange wordes borderinge on such strange desygns that made me hasten further and leave the presence." Harington could only conclude that "ambition thwarted in its career dothe speadily leade on to madnesse." To judge from his account Essex in those last days was not responsible. "Thank Heaven," he says, "I am safe at home and if I go into such troubles again I deserve the gallows for a meddling fool." Only in October, 1601, after the execution of Essex do we hear of another visit, and gain a brilliant picture of the failing Queen, still more broken by the death of her old time favorite. Thus he writes to Sir Hugh Portman: "Much was my comfort in being well received, notwithstanding it is an ill hour for seeing the Queen. The madcaps are all in riot and much evil threatened. In good soothe I feared her Majestie more than the Rebel Tyrone, and wished I had never received my Lord of Essex's honor of knighthood. She is quite disfavored and unattird and these troubles waste her muche. She disregardeth every costlie cover that cometh to table, and taketh little but manchet and succory potage. Every new message from the city doth disturb her, and she frowns on all the Ladies. I had a sharp message from her brought by my Lord Buckhurst (Sackville, the joint author of Gorboduc, the first English tragedy and that in blank verse—another of these astounding Elizabethans playing many parts—now Lord Treasurer in succession to Burghley), namely, thus: 'Go tell that witty fellow, my godson, to get home: it is no season now to foole it here.' I liked this as little as she dothe my knighthood, so took to my bootes and returned to the plow in bad weather. I must not say much even by this trustie and sure messenger, but the many plots and designs hath overcome all her Highness' sweet temper. She walks much in her privie chamber, and stamps with her feet at ill news, and thrusts her rusty sword at times into the arras in great rage. My Lord Buckhurst is much with her, and few else since the city business, but the dangers are over and yet she always keeps a sword by her table."

In another letter of this period he states: "The Queen was reduced to a skeleton: altered in her features: her taste for dress gone: nothing pleased her: she stamped and swore violently at the ladies of the court, whom she tormented beyond measure."

Late in December, 1602, Harington writes from court to his wife. "Sweet Mall," he writes, "I herewith send thee what I would God none did know, more ill bodings for the realm and its welfare. Our deare Queene, my royal godmother, and the States natural mother doth now bear show of human infirmitie, too faste for the evill which we shall get by her dethe, and too slow for that good which she shall get by her release from paine and miserye.

[25] After the defeat of the Armada Howard of Effingham only knighted five, and among those five were Thomas Howard, Hawkins, and Frobisher.

[26] In a letter to Sir Hugh Portman in that year Harington, writing of the Lord Treasurer who was at Bath taking the waters, reports that his distemper did marvellously trouble the Queen "who saith that her comfort hath been in her peoples happiness, and their happiness in his discretion."

[27] Letter to Mr. Robert Markham, 1606.

"Nowe, on my owne parte, I cannot blote from my memories table the goodness of our Sovereigne Ladie to me, even (I will saie) before borne; her affectione to my mother who waited in privie chamber, her betteringe the state of my father's fortune (which I have alas! so much worsted), her watchings over my youthe, her likinge to my free speech and admiration of my little lernynge and pocsy, which I did so much cultivate on her commande, have rootede suche love, suche dutyfull remembraunce of her princelie virtues, that to turne askante from her condition with tearlesse eyes would staine and foule the springe and founte of gratitude."

Altogether it is a pathetic picture, this of the twilight of Elizabeth. Witness this little note regarding one of his last audiences. The Queen had made enquiries about some of his recent verses and Harington, "to feede her humoure," read them to her, "whereat she smilede once and was pleased to saie: 'When thou doste feele creeping tyme at thy gate, these fooleries will please thee lesse; I am paste my relishe for such matters: thou seest my bodilie meate dothe not suite me well; I have eaten but one ill tastede cake since yesternighte.'" Poor old Queen! Bereft of steadfast support when with advancing age and heavy infirmity she most needed it, feeling her impotence, recognizing, as she must, that those surrounding her were full of thought concerning not herself but that successor she so hated to contemplate: her very impatience and temper over these things estranging that court.

That Harington loved the old Queen there is no doubt: the affection shines through all he writes about her. Nevertheless, he was a courtier and with the others he had to prepare for the future. It is a politic but not a pleasant episode. At this very period we find him writing a tract upon the succession to the crown,[28] showing that James of Scotland was from all considerations the right and the acceptable heir to the throne—while to make assurance doubly sure he sent a Christmas gift to James at Christmas, 1602, of which the following is a partial description:

A dark lantern made of four mettels, gold, silver, brass and iron. The top of it was a crowne of pure gold, which also did serve to cover a perfume pan. There was within it a shield of silver embost, to give a reflexion to the light, on the one side of which was the sunne, the moone and vii starres, on the other side, the story of the birth and passion of Christ, as it is found graved by a king of Scots, (David II) that was prisoner in Nottingham. . . . .

The word was that of the good theife.

"Domine, memento mei cum veneris in regno"

And a little beneath "Post crucem, lucem," etc.

This was accompanied by descriptive verses.[29] The acknowledgment by James is characteristic:

To our Trusty and Well belovede Sir Johne Haringeton, Knight.

Ryhte trustie and welbelovite Frinde, we greete you heartily weill. We have raissavit your lanterne, with the poesie yow sende us be owr servande, Williame Hunter, gevinge yow hairtie thankes; as lykewayse for yowr laste letter quhawin we persaife the continuance of yowr loyall affectione to us and yowr servyce; we shall not be unmyndefule to extende owr princelie favoure heirafter to yow and yowr perticulers, at all guid occasions. We committe yow to God.

James R.

From our courte at Hally ruid
Howse, April the Thyrde, 1603.

When, therefore, we find jotted down in the "Breefe Notes" after the Queen's death: "Kelston, 1603. Here wyll I reste my troublede mind, and tende my sheepe like an Arcadian swayne, that hathe loste his fair mistresse: for in soothe, I have loste the best and faireste love that ever shepherde knew," we cannot help feeling that the shepherd was not wholly Arcadian in his simplicity.

Nevertheless, the change from the capable if domineering Queen to the pedagogue of a king, with all the pedagogue's besetting sins, was too great for Harington to stomach. He made the effort, but possessing neither youth nor personal charm he did not attract James nor did James and his court appeal to him. This is abundantly evident in his description of the first audience with the king as described in a letter to his cousin, Sir Amyas Paulet:[30]

It behoveth me now to recite my Journal respectynge my gracious commande of my Sovereigne Prince, to come to his closet: which matter as you so well and urgentlie desyer to heare of, I shall, in suchwyse as suitethe myne beste abilitie, relate unto you, and is as followethe: When I came to the presence chamber, and had gotten goode place to see the Lordlie attendants, and bowede my knee to the Prince; I was orderede by a specyal messenger, and that in secrete sorte, to waite a whyle in an outwarde chamber, whence in near an houre waitinge, the same knave ledde me up a passage, and so to a smale roome where was good order of paper, inke, and pens, put on a boarde for the Princes use. Soon upon this, the Prince his Highness did enter, and in much goode humour askede if I was cozen to Lorde Haryngton of Exton? I humblie repliede, His Majestie did me some honour in enquiringe my kin to one whome he had so late honourede and made a Barone: and moreover did adde, wee were bothe branches of the same tree. Then he enquyrede muche of (my) lernynge, and showede me his owne in such sorte, as made me remember my Examiners at Cambridge aforetyme. He soughte much to knowe my advances in philosophye, and utterede such profounde sentences oute of Aristotle, and such lyke wryters, which I had never reade, and which some are bolde enoughe to saye others do not understand: but this I must passe by. The Prince did nowe presse my readinge to him part of a canto in Ariosto, praysede my utterance, and said he had been informede of manie as to my learninge, in the tyme of the Queene. He asked me, What I thoughte pure witte was made of; and whom it did beste become? Whether a kinge shoulde not be the beste clerke in his owne countrie, and, if this lande did not entertayne good opinion of his lernynge and good wisdom? His Majestie did much presse for my opinion touchinge the power of Satane in the matter of witchcraft; and askede me with much gravitie, If I did trulie understand why the Devil did worke more with anciente women than others? I did not refraine from a scurvey jeste, and even said (notwithstandinge to whome it was saide) that we were taughte hereof in Scripture, where it is tolde that

[28] Published by Sir Clement Markham, Roxburghe Club, 1880.

[29] These are preserved in the University Library, Edinburgh, and are given in the 1804 edition of the "Nugae."

[30] This letter gains an added interest when it is remembered that Sir Amyas' father had been one of the jailers of Mary Queen of Scots, and was intimately concerned, along with Secretary Davison in the matter of the order for her execution.

the Devil *walketh in dry places.* His Majestie, moreover, was pleased to saie much and favouredlye, of my good report for merthe and good conceite: To which I did covertlie answer, as not willinge a subjecte shoulde be wiser than his Prince, nor even appeare so. More serious discourse did next ensue, wherein I wantede roome to continue, and sometime roome to escape: for the Queene his mother was not forgotten, nor Davison neither. His Highness tolde me her dethe was visible in Scotlande before it did really happen, being, as he said, spoken of in secrete by those whose power of sighte presentede to them a bloodie heade dancinge in the aire. He then did remarke muche on this gifte, and said he had soughte out of certain bookes a sure waie to attaine knowledge of future chances. Hereat he namede many bookes, which I did not knowe, nor by whom written, but advisede me not to consult some authors which woulde leade me to evil consultations; I tolde his Majestie, the power of Satan had, I much fearede, damagede my bodilie frame: but I had not farther will to cowrte his friendshipe for my soules hurte. We next discoursed somewhat on Religion, when at length he saide: "Now, Sir, you have seen my wisdome in some sorte, and I have pried into yours. I praye you, do me justice in your reporte, and, in good season, I will not fail to add to your understandinge, in such pointes as I may find you lacke amendemente." I made courtesie hereat and withdrewe downe the passage, and out at the gate amidst the manie uarlets and Lordlie servantes who stood arounde. Thus you have the historie of your neighboures highe chaunce and entertainmente at Cowrte; more of whiche matter, when I come home to my owne dwellynge, and talk these affaires in a corner. I muste presse to silence hereon, as otherwyse all is undone. I did forget to tell that his Majestie muche askede concerninge my opinion of the newe weede Tobacco, and said it woud, by its use, infuse ill qualities on the braine, and that no lernede man ought to taste it, and wishede it forbidden. I will nowe forbeare further exercise of your tyme, as Sir Robertes man waitethe for my letter to beare to you, from,

Your olde Neighbour, Friend and Cosine,

I. Harington.

But James did what Elizabeth had not done, he made him a Knight of the Bath, giving him also apparently some sort of supervision over the education of his eldest son, Prince Henry, whose early promise was cut short by death as he was entering manhood. There are extant several letters and essays written to or on behalf of the Prince. It would seem, though, that the latter years of Sir John Harington were overclouded with debt and the sense of ill success. We hear rumors of violent quarrels with his mother-in-law over money matters; of forcible seizure by him of her effects: rumors of law suits and even of imprisonment: of sale of an estate to provide the necessary means. Possibly the need to provide for a large family, made it necessary that he should don his "clouted shoes" and "frize" and "gamoshes," and tend his "oxes and boxes" at Kelston. The old Elizabethan belief that he could accomplish everything showed itself amusingly in 1605, when upon the death of Archbishop Loftus, Chancellor of Ireland, he wrote to Cecil urging that his study of and sympathy with the Irish people, and his own character, would make him an eminently suitable successor, urging further that he might also be given the Archbishopric: that it was wise to unite the temporal and spiritual power!

The next and almost the last incident in his career has a peculiar interest for us as medical men. Everyone, I take it, knows about the Regimen Sanitatis or Flos Medicinæ of Salerno—throughout the middle ages and even through the Tudor period, the most popular domestic manual upon the preservation of health. Up to the year 1835 Choulant[31] gives a list of 119 editions of the Latin text (of which 21 are incunabula), 33 editions of German translations, 14 of French, 9 English, 9 Italian, 3 Bohemian and 1 Dutch. Nor is this complete. That the work should have been popular in England is suggested by its opening lines: "Anglorum regi scribit Schola tota Salerni.

I doubt not that Dr. MacCallum in his discussion before this Society entered into the claims of the unfortunate Robert of Normandy, son of William the Conqueror, and dispossessed of the throne by his younger brother Henry, to be considered as the courtesy king here referred to.[32]

Sir Alexander Croke[33] notices five editions of Thomas Paynel's Regiment of Helthe, namely, of 1530 and 1541 (printed by Berthelet), 1557 and 1575 (printed by Vele or Veale), and 1597. Choulant only notices three (1530, 1541 and 1583). If Choulant is correct regarding the existence of a 1583 edition then there were at least six renderings prior to 1600. But, as shown by the 1541 edition brought before you, these are translations at most of Arnaldo di Villanova's commentary: the text is given in the original Latin. The translations of the text, if I mistake not, only appear after 1600 and then appropriately in verse. For it must be remembered that the Regimen is written in leonine verse—in rhymed hexameters: rhymed in order that they might the more easily be committed to memory. Time forbids that I should dwell upon the rhymed Latin verse of the middle ages, sacred and profane.[34] Sir Alexander Croke, already referred to, gives examples of 30 or more forms of rhymed hexameters, from the simpler forms encountered in the Regimen up to cases in which all the words of both lines in following verses rhyme together ("undique relato"), as in the following instance of appalling ingenuity:

Plura precatura pura, cura valitura,
Cura mansura procura jura futura.

And the first and the freest of these rhymed English translations was that by Harington.[35] Here again there is some doubt regarding the number of editions, a doubt which in the time at my disposal I have found it impossible to clear up. There are copies in the British Museum and the Bodleian

[31] Handbuch der Bücherkunde für die ältere Medicin, reproduced with additions by Renzi, Collectio Salernitana, Vol. I, 1852, p. 419.

[32] He is known to have visited Salerno in 1096 or 1098: the tradition is that on his return from the Holy Land in 1100, the year of his brother William the Second's death, he revisited Salerno, to be cured of a fistula which followed upon a deep arrow wound.

[33] Regimen Sanitatis Salernitanum, Oxford, Talboys, 1830.

[34] Needless to say that the choicest examples of the former are to be found in the Breviary and perhaps needless to refer to John Addington Symonds' delightful cull of the best examples of the latter—the Goliardisms of the *Vagi clerici*—in his "Wine, Woman and Song," of which Mosher has published so admirable a reprint.

[35] The late Bishop Creighton, author of the article upon Harington in the Dictionary of National Biography refers mistakenly to this work as a rhymed version of certain aphorisms of Cardan.

(which I have not seen), but none at Cambridge, at the Surgeon General's Library, the Astor and Lenox libraries of New York, nor again at the College of Physicians in Philadelphia. It is always an evidence of popularity of a sixteenth or seventeenth century work when, despite numerous editions, scarce an example has survived: it means that the copies were so well thumbed that they became disreputable, and banished from the shelves. The first edition was published anonymously and Croke who reproduces it was ignorant of the authorship.[36]

Some old notes of mine mention an edition of 1608. There certainly was one in 1609 (given by both Croke and Choulant), another printed at Gateshead for the widow Helme in 1617 (Croke), and yet another printed by Dowe in London in 1624. These two last contained also, if I mistake not (for Croke is confused upon the point), a translation of the De Conservanda Valetudine of Ransovius.

In 1609, according to Croke, appeared a second rhymed translation, also anonymous, that of Dr. Philemon Holland, with reprints in 1617, 1624, 1634, 1649 and 1667.[37] It is safe to say, therefore, that prior to 1700 there were at least five reproductions of the original text in England and 10 (probably more) editions of rhymed versions.

I have entered into this bibliography of the Regimen to indicate that there is ample room for a thorough study of the English editions. I must not neglect to mention the latest excellent rhymed version of Dr. Ordronaux, of New York, published by Lippincott in Philadelphia in 1870 (quarto), and 1871 (octavo).

But of all these the most spirited is beyond doubt that of Sir John Harington, as witness this translation of:

> Si tibi deficiant Medici, medici tibi fiant
> Hæc tria: mens læta, requies, moderata diæta.
> Use three physitians still, first doctor Quiet,
> Next doctor Mery-man, and doctor Diet.

The translation it must be owned is free, but the spirit is well caught.

> For water and small beare we make no question
> Are enemies to health and good digestion;
> And Horace in a verse of his rehearses,
> That water drinkers never make good verses.[38]

And it must be confessed that there are additions to suit the times which may still appeal to Baltimorians, although rumor has it that the stock of the latter wine is running sadly low both here and in Philadelphia:

> Canary and Madera, both are like
> To make one leane indeed (but wot you what)
> Who say they make one leane wold make on laffe
> They meane, they make one leane upon a staffe.

This I find reprinted in the Epigrams. It may, however be regarded as an expansion of the commentary: "That whyte wyne is weaker than other wynes apperethe by this that Galen saythe: . . . . It is impossible that whyte wine shulde greatly enflame any man. And he sayth, whyte wyne enflameth or heateth leaste of all wynes. Whiche thynge is trewe if one wyll make comparison betweene whyte wyne and redde of one countre growyng, and none other wyse. For the redde wynes of France are not so hotte, nor yet so stronge as the whyte wynes of some other countre. And therefore the comparyson muste be made bytwene the wynes of one maner and countre, and whyte wyne nourishethe less than other wynes.[39]

With this last important work let us leave Harington; for there is little more known about his later years, save that he died in 1612.

But what a strange life it was, what a strange mixture this favorite godson of the great Elizabeth—wit, courtier, master of horse, poet, translator of the School of Salerne, would-be archbishop—and inventor of the water closet. "I marvell," says Harington, "to thynke what strange humors conspire to patch up the natures of some myndes."

Perhaps, gentlemen, invited to come all this way, it had been a more fitting response to your courtesy had I chosen some more serious text, some less unheroic hero. And yet just as it is pleasant to wander off the commonplace and dusty high road into some side path among the fields and through the coppice, so has it been a delight to explore this bye way that strikes so far off from the main road of medical history. If I have conveyed to you a tithe of the pleasure that the excursion has afforded me then am I amply repaid.[40]

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[36] The | Englishman's | Docter | or | the Schoole of Salerne | or | Physicall observations for the perfect | Preserving of the Body of man in | continuall Health | London | Printed for John Helme and John Busby, Jun. | and are to be sold at the little shoppe | next Clifford's Inn gate, in Fleet | Street 1607.

The publisher in his preface says "It came to me by chance, as a jewelle that is found . . . . The author of the paines (? poem) is to me unknowne, and I put this child of his into the open world without his consent."

[37] Croke states that the 1634 edition is signed R. H. (Richmond Holland) and that the preface attributes the work to his father, Dr. P. Holland. The copy of the 1634 edition at Philadelphia has preface signed by R. H. with no reference to the authorship. It is the 1649 edition (also at Philadelphia) signed H. H., Φ. F. (? Philemonis Filius), Londinopolitanus, and addressed to Sir Simon d'Ewes that refers to "my deceased learned father, Dr. Holland, his many emendations and additions."

[38] Line 221. Absit ab humano pectore potus aquæ.
Line 246. Potus aquæ sumptus fit edenti valde nocivus
Hinc friget stomachus, crudus et inde cibus.
Line 255. Grossos humores nutrit cerevisia, vires
Præstat, et augmentat carnem, generatque cruorem
Provocat urinam, ventrem quoque mollit et inflat.

[39] Paynel—The Regiment of Helthe, 1541 edit., pp. 20 and 21.

[40] A visit to Washington made after delivering the above address shows us that happily my statement regarding the absence of any copy of Harington's "Schole of Salerne" in the larger libraries of this continent is incorrect. The Surgeon-General's library possesses the 1624 edition printed by Thomas Dewe (not Dowe) in which the authorship is acknowledged. It contains further the 1535 (Berthelet), 1541 (do.), 1557 (Vele), 1575 (Veale), and 1597 (T. Crede) editions of Paynel's "Regiment," together with the 1617 (B. Alsop), 1634 (Alsop and Fawcet), and 1649 (B. Alsop) editions of Philemon Holland's rendering.

II. THE SCHOOL OF MONTPELLIER.[1]

By W. G. MacCallum, M. D.,

Associate Professor of Pathology, Johns Hopkins University, Baltimore.

The early history of Montpellier loses itself in the darkness of the middle ages. The town apparently arose about 738 when, on the destruction of Maguelonne by Charles Martel, the fugitives found refuge at Montis Pessulani, named from the neighboring place where high boulders seemed to attest the activities of some earlier people. There was a liberal sprinkling of Jews and Arabs in this first settlement and for a long time their influence was felt, although at first the Jews were persecuted as they had always been. Physicians there were in those times who made such excellent cures that their fame spread abroad and in 1137 we read that Archbishop Adalbert II of Mayence journeyed there by way of Paris to consult some of these eminent men. William VIII, the prince of that region, angered by the persecution of the Jews, issued a decree giving liberty to teach, to all, of whatever creed or nationality, who felt themselves capable of teaching, and this was to hold for all future times. Discussion arose, however, and in 1220 Honorius III felt it necessary to send a pontifical legate to regulate their affairs. Cardinal Conrad, a German archbishop of St. Firmin, was this man, who by an edict established for the much praised school of Montpellier a constitution which should regulate the choice of professors and subject them to the bishop of Maguelonne. Only those were granted the privilege of teaching who were approved by that bishop and two of his chosen professors. A chancellor was elected and the relation of the students to him and the school defined. Later, in 1289, Clement V, on the advice of Arnold of Villanova, Jean d'Alais and Guillaume de Mazeres issued three bulls to regulate the examinations through which the students must pass before being granted their degrees and license to practice and further regulating and prescribing the authors to be studied, and even the very books to be used in the teaching of the school. Thus arose a well ordered school whose dignity and discipline has been maintained until the present day.

At this time the famous school of Salerno was passing the zenith of its glory. Already it was being dominated by the Arab medicine and was neglecting the purer stream of Greek medicine which it had so long cherished. It was at this time too that there arose throughout Europe the great philosophical movement which changed the character of medical thought. In the place of the simple objective descriptions of the older writers men began to look upon the idea as the primary reality, the thing itself as a result which must be regarded with reference to this primary idea and all became involved in an inextricably tangled web of disputation and dialectic from which no clear result could be expected. Skill in twisting and distorting question and answer was indeed developed to an extraordinary degree but the real purpose of knowledge was stayed in this side eddy. Bernard Gordon, a writer of Rouergue, who was one of the physicians of Montpellier, was through and through a Scholastic as his writings attest. He, as Gui de Chauliac declared, was nourished among philosophers, and his works are little more than the complicated embroidery of a few of the books of his illustrious predecessors. Profound believer as he was in the astrology and magic of the times, we find some remarkable mystic formulæ and amulets which, in his hands, were said to cure the gravest diseases.

Of quite another stamp was the great Arnold of Villanova, perhaps the very greatest man of whom Montpellier may make her boast. In his adventurous life, so well discussed by Lalande and others, he still found time for the most extraordinary amount of personal observation and experiment, and it was really to his skill in experimentation, as well as to his broad independence of thought, that we must ascribe much of his true worth. Astrologer, magician, and alchemist—he undoubtedly was—indeed he was regarded as the greatest of all alchemists even by his student, the celebrated Raymond Lully. He was really the discoverer of the spirit of wine and of the application of alcohol in diseases, as well as many other chemical substances which have kept their place to this day. Aside from his belief in amulets and magic formulæ and the influence of the stars, he was extremely objective and reasonable, and we cannot be surprised to find in those days, even this the greatest man of his time, a devout believer in the supernatural. But he was relatively emancipated from the cramping dogmas of his predecessors. He saw with his own eyes and operated with his own hands and knew that the things themselves were the rational basis of a medical science which could by no means be built up on a fabric of reasoning, and it was his great service that he sent the first gleam of light into the darkness prepared by the scholastics. He was the spirit of the pre-renaissance. That he taught for a time at Montpellier seems fairly clear, although his actual work there is somewhat veiled by the lapse of time and the meagerness of the records. He died in 1313 while on his way from Sicily to visit Clement V at Avignon.

After him in the fourteenth century there looms up another great figure, Gui de Chauliac, the surgeon who was probably not definitely a teacher at Montpellier but who speaks of it as "our faculty," and of the others there as his intimates. He too was a reasoning objective thinker, whose works were the standard text-books for hundreds of years, and one reads them with delight even to this day. His descriptions of the plague that raged in the whole of that century in the south of France, are unsurpassed in their graphic presentation of the horrors of those times. Others, especially Raimond Chalin de Vinario, wrote at the same time of the same plagues but not in the same enthralling way.

[1] Paper read before the Johns Hopkins Hospital Historical Club, April 13, 1908.

Jean de Tornamira, Gerard de Solo and Ermengaud Blasius were others who flourished in this century but have left no such deep impress on the times, contenting themselves usually with the translation into rather bad Latin, of some of the Greek or Arab authors, to which they added commentaries, the results of their prescribed lecture work. Joannes Pisis, Valescu or Balescon de Tarante with his Philonium, or review of the practice of medicine fantastically divided like a flower into seven parts; Joannes des Concoregio, Joannes Bruguiere, Martial de Genoilhac or Genouillac, are names which echo out to us from the ancient roll of chancellors up to 1470, but they are now little more than names. So it is too with Bassolus, Louis Saporte the ancestor of several other Saportes who appear later, Beaucaire, Trossellier, Martini Miro, Corandus and Jacques Ponceau, which brings us to the time of Louis XII and the Royal Professors.

Up to this time the income of the professors had depended upon their students and there were rules laid down even by Conrad which regulated the relations of teacher to student, and the method by which the lectures must be given so that the student could derive from them the greatest good. No professor might read the same author twice in succession, nor might two discuss the same work at the same time. Since the emoluments varied with the number of students and many of the doctors were unwilling to teach for glory alone, there were times when hardly any lectures were given and the disorder was great in consequence. The school was exposed to interruptions which menaced it with a complete downfall. It was at this time that Charles VIII, informed of the laxity that prevailed, established four regencies or royal chairs which were confirmed and really established by his successor, Louis XII, with fixed salaries and privileges and rights to the emoluments accruing together with the authority to examine the students. The immediate result was the disappearance of the great crowd of teachers who had divided the honors and emoluments before. Since their authority was gone they retired, although for a long time several young doctors continued as *aggrégés,* the number being later reduced to two.

The mode of teaching and character of the teaching remained almost unchanged through this. The first of these four professors was Grassin and Robert Pierre was another, Piequet a third, none of them men of great eminence, but they were soon followed by Tremolet, Fontanon, Faucon, Griphi and Schyron. The most interesting of the early royal professors was undoubtedly Rondelet who, after a sickly youth spent in Paris, returned to his birthplace, Montpellier, where with Griphi as his chosen preceptor he graduated in medicine and afterwards went with Cardinal Tournon to Italy. There he did much of his celebrated work on fishes, for in ichthyology he became a well known authority. In 1545 he replaced Pierre Laurent in one of the chairs at Montpellier. As he was interested in anatomy he played a great part in the construction of the old amphitheater of the school and meanwhile wrote a number of treatises on fevers, therapy, etc. He was a famous physician and died while visiting the sick wife of one of his friends. Huge in frame and stout, he attracted the lively interest of Rabelais, who immortalized him as Rondibilis.

His writings are not admirable, for Rondelet composed, as Astrue tells us, with precipitation without having reflected upon what he wished to say or upon how he should say it, and without reading over what he had written.

With Rondelet there lived in his house a student for whom he had conceived a friendship, Laurent Joubert, who was born in Valence in 1529. Joubert was unable to accept in marriage either of the daughters of Rondelet who were offered him by their father with an insistence that embarrassed Joubert, because the oldest of these daughters did not please him and he was sensible that he was not pleasing to the younger. When Rondelet died his chair fell to Joubert, who taught there until his death in 1582. Joubert's works are not especially important but he is interesting as the representative in Montpellier of the antigalenistic movement which arose at this time.

Paracelsus had raged against the dogmas of Galen and the sort of false Galenism which had rendered the system more than ever rigid and cramped, and had brought forward his idea of specific remedies or arcana for disease. These are found in the most various substances and among them mineral salts were prominent. It was by the ill-considered use of some of these substances, especially quicksilver and antimony, that ignorant physicians had caused serious injuries to their patients and there arose an uproar on the part of the Paris school and others against their use and especially against the use of antimony. It was in this regard that Joubert took strongly the side of antigalenism.

In Paris it was forbidden by a decree of 1567 to administer antimony and Turquet de Mayerne of Montpellier, who advocated it there in the medical faculty of Paris, was ejected from its membership and forced to flee to England where he became physician to Kings James I and Charles I, to his great fame and glory.

It was about this time that François Rabelais was associated with Montpellier. Born at Chinon, he led the life of a vagabond monk until 1530, when he studied at Montpellier for nearly two years; there he gave his public readings on the Aphorisms of Hippokrates and works of Galen and incidentally wrote comedies for the students. In 1532 he went to Lyons where he wrote his Pantagruel and Gargantua. Later after many adventures he returned to Montpellier in 1537 and received his doctorate, and afterwards gave public lectures on the Prognostics of Hippokrates, which he explained from the original Greek—a thing practically unknown in that school. He even entered the faculty that year teaching anatomy. His name has been greatly honored in the school of Montpellier ever since. His bust stands in the court—his portrait in the *Salle des Robes* and every student wears at his examinations the red robe of Rabelais.

After Joubert came Nicolas Dortoman, who studied the waters of the spring at Balarue, and Jean Hucher, a nobleman of Beauvais, who became chancellor in 1583. Antoine Saporta and his son Jean lived at this time too, and each was chan-

cellor for a time. Nicholas Dortoman and André du Laurens played an important rôle in that they became physicians to the king and were then able to manage the establishment of two new double chairs in the school of Montpellier. These were the chairs of botany and anatomy and of surgery and pharmacy. Up to the time of Gui de Chauliac no dissections had been carried out by the Jews and Arabs whose religion forbade them to touch a body, but in 1376 they asked and obtained from Louis d'Anjou permission to dissect each year the body of one of the executed criminals. This was ratified in subsequent years by several of the kings and the privilege was thus in the hands of the faculty of Montpellier long—two hundred years—before it was introduced by J. Sylvius in Paris. Nevertheless it must be confessed that whether from neglect or lack of skill they failed to profit much by it.

When Henry IV in 1595 established the chair of anatomy and botany and placed in it Richer de Belleval with Barth. Cabrol as his assistant, he paved the way for the growth of surgical studies, and in truth he himself set up in 1597 the chair of surgery and pharmacy, which he entrusted to Pierre Dortoman, the son of Nicholas Dortoman. In this project he was aided by Nicholas Dortoman and André du Laurens.

Difficulties arose between the more cultured and highly educated students of medicine and the students of surgery and pharmacy. Lectures must be given to this latter class in French instead of Latin, and it was even necessary to insist that the surgical aspirants should limit themselves to the approach by way of the rue de Cannou, leaving the rue St. Matthieu to the medical students, since fierce battles arose when they came together. Further, to prevent these encounters Dortoman was forced to separate his lectures, explaining to the medical students Galen's treatise on tumors in the afternoon at 2 o'clock, while for the turbulent surgeons he commented on the works of Gui de Chauliac at 4 in the morning and for the pharmacists the fifth book of Dioscorides at noon. Dortoman served with zeal in this double chair for 12 years, but then, wearied, he asked for relief and on the death of du Laurens was made physician to the king.

In 1635 the company of master surgeons of Montpellier decided to establish official annals like those of the faculty of medicine where it might inscribe its acts, and these records extend from 1635-1683. The company of surgeons numbered at first 40 members, but included no great men during these times. There were constant quarrels and disclosures of corruption among them, and in 1640 they were publicly condemned, in that they had abandoned the city during the epidemic of the plague in order to save themselves—conduct in grievous contrast to that of Ranchin and others in the faculty. When in 1692 Louis XIV established the offices of surgeons royal, the company of surgeons in haste made new rules for themselves in the effort to be ready to secure the prizes, the two offices which were offered, and these new regulations established in more respectable form, the position of surgeons in the city. It was at this time that François Lapeyronie entered on the scene. He was educated by his father, Raymond Lapeyronie, in the art of surgery and received his masters degree in 1695. This was a degree very different from that of the medical faculty giving him the privilege of practicing surgery and barbery and of keeping an open boutique or shop, in front of which he might hang basins. Pierre Chirac presided at the triduanes of this student, showing that the faculty of medicine must at least be represented in their examinations.

The school of surgery was frequently in debt and borrowed money. Among other things it entered on a dispute with the *perruquiers,* who formed a separate society, as to the limits of their professions, the surgeons claiming it their right that they should perform the offices of painting and powdering perrukes just as they curled and powdered natural hair, although they did not dispute the right of the *perruquiers* to manufacture wigs. They even consented to abstain from curling wigs and making them up into puffs but the use of paint and powder seemed to them their exclusive domain. The trial was dragged out through several years before the parliament of Toulouse, but the surgeons lost their case and had to borrow more money to pay the costs.

There were disputes with the school of medicine, the professors of which finally even withdrew from any participation in their examinations. In 1741 the king charged them to teach the branches of surgery in the four established chairs and to build a new building for that purpose which in time they did with the legacy of Lapeyronie in the rue Grande, a building that far outshone the old school of medicine. Houstel also made a great benefaction for the study of practical surgery and the school grew, although the students were indolent and wayward and always enormously inferior to the teaching body. It was suppressed in 1792 and disappeared in 1794, and was united in the new *École de Santé,* created by the national constitution on December 4, 1794, with the *École de Médecine.* The new school thus founded was installed in the old bishop's palace, once the monastery of St. Germain.

The other chair established in 1593 in the medical school, by Henry IV, was destined for the teaching of anatomy in the winter and botany in the summer, and Richer de Belleval was chosen to fill this post. He was born in Chalons sur Marne and studied medicine in Montpellier but practiced at Avignon. No sooner was he established in his chair than he began to cause difficulties, for in spite of the earnest remonstrances of the rest, and even of André du Laurens himself, he refused to give any lectures in anatomy, although he was interested enough in the botanical studies at the Jardin des Plantes. It was only at his death in 1623 that these troubles were quieted, when his place was taken by his nephew, Martin Richer de Belleval, whose succession had been arranged by his uncle. He was somewhat more tranquil but even he attended to his duties but ill, and on his death, in 1664, was succeeded by M. Chicoyneau.

Prominent among the names of this era is that of François Ranchin, a rich man, who graduated in 1593 and succeeded in 1612 to the chancellorship after the death of André du Laurens. He loved the faculty and spent his great means in embellishing the school. It is to him that they owe the new

amphitheater which replaced the old one, built by Rondelet, and to him belongs the credit of repairing the ancient Collège de Mende and restoring the inscriptions on the walls of the school, as well as erecting several new ones to the memory of Hucher, du Laurens and others. He was the author of the Apollinare Sacrum from which so many details of history of the university have been obtained.

After him Jacques Durant, Lazare Riviere, M. Chastelain, Simeon Courtau, the Sanches and others of whom no deep impression is left. In 1675 long after the turmoil over the innovations in therapy which the followers of Paracelsus sought to introduce in the form of mineral drugs, Louis XIV established a seventh chair in the faculty for the teaching of chemistry and in this was installed Arnand Fonsorbe, who graduated in 1660. He gave courses in chemistry but seems to have made little advance, and on his death, in 1695, his chair was vacant for competition.

Michael Chicoyneau succeeded to the chair which Durant left vacant in 1659, but in 1664 when Martin Richer de Belleval died, he arranged to succeed him in all his places and this he contrived to do by political methods, despite the opposition of the faculty, for he stood high in favor with de Valot, the physician to the king. He was a haughty, quarrelsome man who acquitted himself of his various professional functions with exactitude but without any superior talent. I cannot find that he wrote anything of note. With this family, however, the methods of nepotism were still further abused at Montpellier, for Chicoyneau attempted to transmit to three of his sons in succession his offices as professor and chancellor. Since, however, two of them died in youth, he was forced to recall the third, François, whom he had destined for a naval life, to the study of medicine. In the very year of his graduation, 1693, he obtained through Antoine d'Aquin, the king's physician, the provision for his succession to the chair. Thus at 21 the young man assumed the high offices of his position as professor and chancellor and although he was no distinguished anatomist nor botanist, his grace and facility were such that he was generally loved and respected. After a mission to Marseilles during the plague from which he returned with great honor, he died, aged 80, in 1572. Chirac, who was at that time physician to the king and sent Chicoyneau with Verney and Deidier to Marseilles, had himself curious ideas about the plague, believing it to be not at all contagious. Chirac graduated at Montpellier in 1683 and secured by the help of M. Chicoyneau and d'Acquin the chair of Tenque at Montpellier. He was a much honored professor, respected by the students, but his actual work was slight and always involved in quarrels as to priority. Astruc speaks with especial scorn of his mode of thought, the *méthode analytique* which consists in saying as much as one would on the subject of which one understood nothing without bringing to it the least illumination. Of his book, "*De motu cordis,*" the same writer says that it is undoubtedly the poorest book that has appeared in all the history of medicine.

It was in his time that Raymond Vieussens was a student at Montpellier and on one occasion there arose a violent dispute between them as to priority in the discovery of an acid in the blood. Vieussens lived and practiced in Montpellier except during the time when he was physician to Mdlle. de Montpensier, but although he wrote many learned treatises, especially upon the anatomy of the nervous system and the heart, the ear, etc., I cannot find that he was ever professor in the school.

Other names which Astruc mentions at this time are those of Jean Bezao, Antoine Deidier, who succeeded Arnaud de Fonsorbe in the chair of chemistry, Lazerme, A. F. Chicoyneau and Jean Astruc.

Up to this time there extend as sources of information the monumental works of Astruc and Germain, but since the beginning of the eighteenth century the activities of the school seem not to have been recorded by any one writer—nor shall any attempt be made to record them here, but rather in a later paper when after another pilgrimage to that ancient seat of learning, they may be more thoroughly known. Nevertheless the chief movement—the support of the doctrine of vitalism—which was represented there by the celebrated Barthez, must be mentioned. P. J. Barthez (1734-1806) was a precocious child; after a period as military physician and another of journalism in Paris, he became professor and vice chancellor of the university of Montpellier in 1773, but in a few years he left again for Paris where he was titular chancellor of Montpellier to Paris. In 1796 he returned to the faculty of Montpellier only to go again in 1802 to Paris as government physician, to which post he was nominated with Corvisart by Napoleon. The underlying thought in his writings is the search for the "elements" of normal and pathological processes. The vital principles are expressed in the "*force de situation fixe,*" that force which tends to bring back to normal the distorted form, size, etc., of the diseased organ. The anomalies of this force play therefore the most important part in pathology and are in a sense the elements of disease which must be combated by suitable methods, natural, analytic, and empirical.

Grimaud and Pinel were scholars of Barthez and carried on his ideas through their work to greater perfection. Pinel in his application of the method of analysis of Condillac was led to the idèa that organs which in healthy and diseased states show similar phenomena, must agree in their elementary construction and this idea, although it guided him to the separation of diseased states according to the organ affected, led the great Bichat, who was also a student at Montpellier, to the separation and distinction of tissues.

The life of the students and their relations to the faculty at Montpellier come to us with interesting side lights in the writings of many of their number. In general there was maintained there, throughout, a dignity and respectful treatment of those in office which is not surpassed in other schools. It is true that there were disputes among the faculty and personal encounters and lawlessness among the students which had to be repressed, but on the whole the history of that body is one full of dignity and charm. Much was done there to protect the public from the charlatans who have in all ages

been so ready to prey upon the credulity of the people. The standards of scholarship were always high and the examinations rigid. The degree from this school has always held the high place it deserves. As to the nature of the examinations and their attendant ceremony, I may translate from Astruc:

"At Montpellier the first of the examinations is that which leads to the Baccalaureat. This act to which one is admitted only after three years of study lasts from eight in the morning to midday and is under the charge of a professor. The student must answer the questions and overcome the difficulties which all the other professors offer him. The dispute concerns the explanation of a disease or a question of physiology at the choice of the presiding professor."

One commences this examination with an ordinary robe but when one is received a different robe is donned—one of red cloth with great sleeves and collar and a small hood, like enough to the ceremonial robe of the professors. This is the famous robe of Rabelais, known through all Europe and regarded as the symbol of the doctorate of Montpellier. It is worn at the examinations until the granting of the license, after which the ordinary robe is resumed. They say that the first robe of that sort was designed toward the middle of the sixteenth century by François Rabelais, a celebrated doctor of the faculty of Montpellier, from whom it takes its name. It was renewed in 1612, but in spite of these changes the robe preserves its name and reputation.

There are then three months during which public lectures must be given in presence of one of the professors, on the treatise of medicine which has been assigned by the dean. These lectures are called *the course*.

This course finished and the three months expired, the aspirant is received to take the four examinations called "*per intentionem*" because they are taken with the aim of obtaining the license. The examinations are under four different professors and treat of four different maladies. The subject is proposed in the evening and next day at the same hour a thesis must be brought in which one explains in detail everything regarding the disease assigned, answers all the objections of the professors on that subject and satisfies all the questions which may be asked on the rest of medicine. These acts are carried out every other day and each lasts an hour or more. Eight days after the end of the examinations, subjects are chosen for the "*points rigoreux*" by lot in two books, one before the chancellor and the other before the dean. The first concerns a disease different from those already discussed and the second an Aphorism of Hippokrates. Next day at midday these two points must be elucidated, all difficulties explained away, and all questions answered. This lasts from midday to four o'clock. Once it was held in the chapel of St. Michael of Notre Dame des Tables as appears by the statutes of 1340 and several other more recent records. But now it is held in the *Salle des Actes* before all the professors.

When the student is accepted after this trial he goes after a week to receive the license from the hands of the bishop of Montpellier or his vicar general in the presence of two royal professors whom the faculty deputes. When the bishop resided at Maguelonne the license was given "*in aula Episcopali*" in the hall of the palace which the bishop of Maguelonne had in the old part of Montpellier, of which he was lord, near the place where the college of Jesuits is built, but now the presentation is made in a hall of the Episcopal palace.

The new licentiate then prepared himself for the triduanes, that is to say, for six other examinations which must be undergone morning and evening during three days. For that purpose he presented a list of twelve maladies to the chancellor, who assigned him three while the dean assigned three others. They took care to choose diseases which had not yet been given to the aspirant. Each of these examinations lasted an hour and was held in the presence of one of the professors.

These tests finished, when the aspirant has merited in all, the votes of at least two-thirds of the professors, he is admitted to the doctorate. The professor who is charged with conferring this degree commences always with a discourse full of instruction and counsel for the new doctor and then gives him the cap with the ordinary formalities. Since this ceremony is carried out with much circumstance and dignity it is called the "*Acte de Triomphe.*"

Formerly this was done in the church of St. Firmin. It was carried out with much solemnity as appeared from the ancient records. Morning and evening on the day when they were to receive a doctor, the great bell of the church was sounded. The faculty in a body led the recipient thither to the sound of instruments of music and accompanied by a crowd of spectators, and after some Latin discourse he was given the ornaments of the doctorate in the presence of the whole assembly, to whom the doctor caused to be distributed, gloves and comfits. At present the ceremony is performed in the *Salle des Actes* of the public schools, but there have been retained of the ancient usages, the Latin discourse, the violins and the distribution of gloves.

The ceremonies of the doctorate practiced at Montpellier and established by usage nearly as ancient as the faculty, consist in the following: the cap is presented; a ring of gold is put on the finger; a belt of gold about the waist; the doctor is presented with a volume of Hippokrates; he is made to sit in the chair beside the professor; the professor embraces him, finally giving him the benediction, each ceremony being accompanied by a short discourse which explains its value and significance.

When we look back over the history of Montpellier, we receive the impression that in all this time there were indeed many learned and useful and true men, but of the really great there were but few and those not permanently attached to the school. The scientific achievements of the school do not stand out, therefore, as epoch-making points in the history of medicine, but there are streams of thought and influence which have had untold value in supporting and directing the great onward current of medical wisdom through those dark ages. As in Salerno, it was especially in Montpellier, that Greek medicine flourished for a long time in the west.

FIG. 1.—View of the *École de Médecine.*

FIG. 2.—Statue of Barthez at the right of the main door of the *École de Médecine.*

FIG. 3.—Statue of Lapeyronie to the left of the door of the *École de Médecine.*

FIG. 4.—Anatomical theater in the court of the *École de Médecine.*

FIG. 5.—Statue of Rabelais in a niche in the court of the *École de Médecine.*

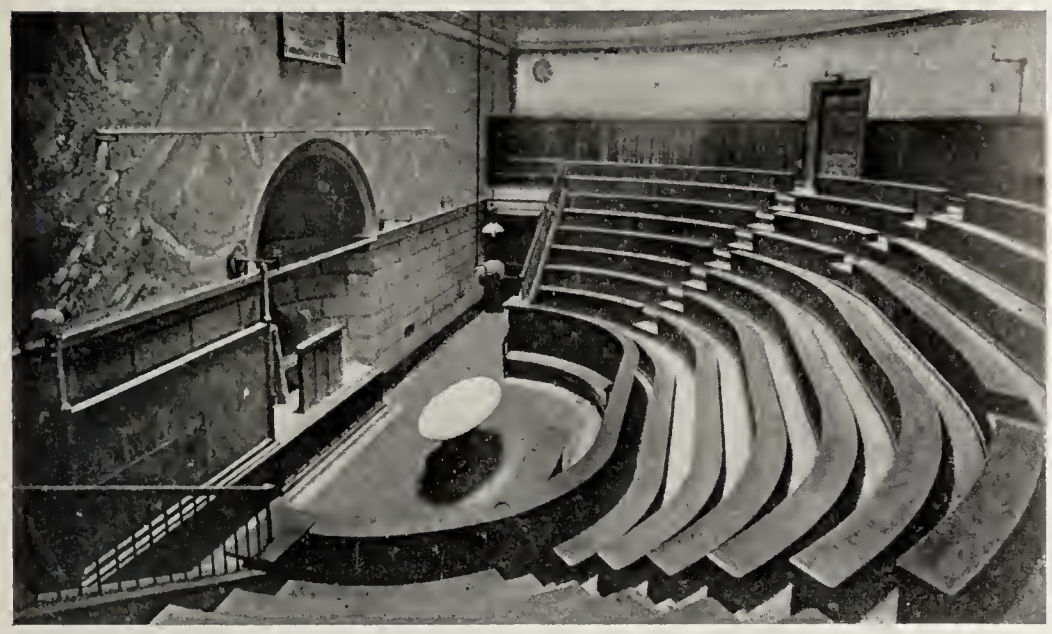


FIG. 6.—Amphitheater in the anatomical theater showing the ancient chair of stone for the professor.

FIG. 9.—*Salle d'Assemblée*—Here and in the *Salle des Robes* is the remarkable collection of portraits of the chancellors.

FIG. 7.—Grand hall of the *École de Médecine.*

FIG. 10.—*Salle des Actes*—Above the chancellor's chair is the small bust of Hippocrates. This hall contains the more modern portraits.

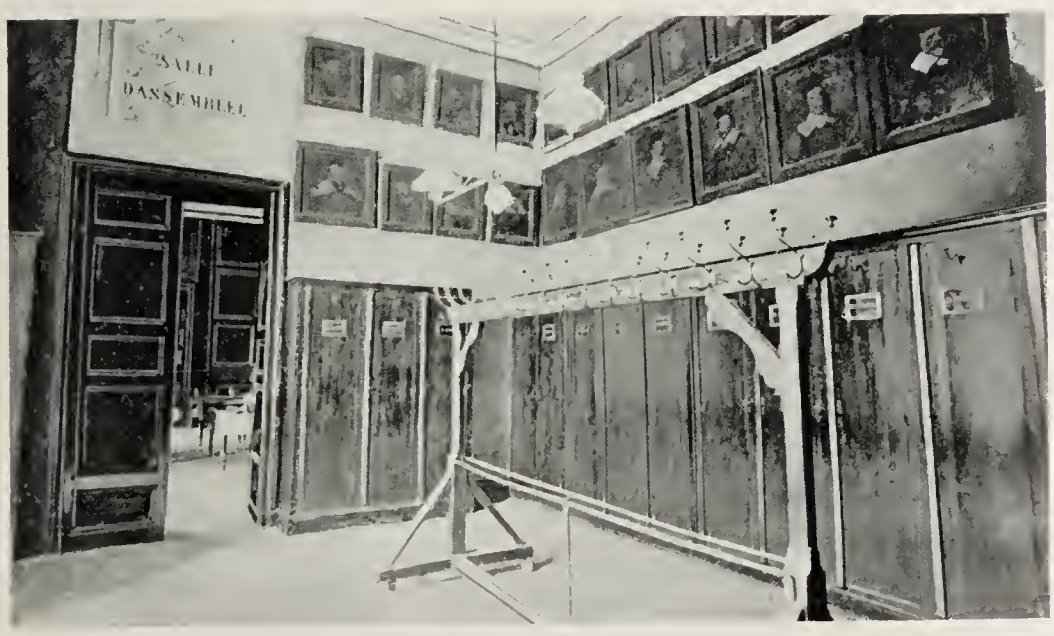


FIG. 8.—*Salle des Robes*—Antechamber to the *Salle d'Assemblée.*

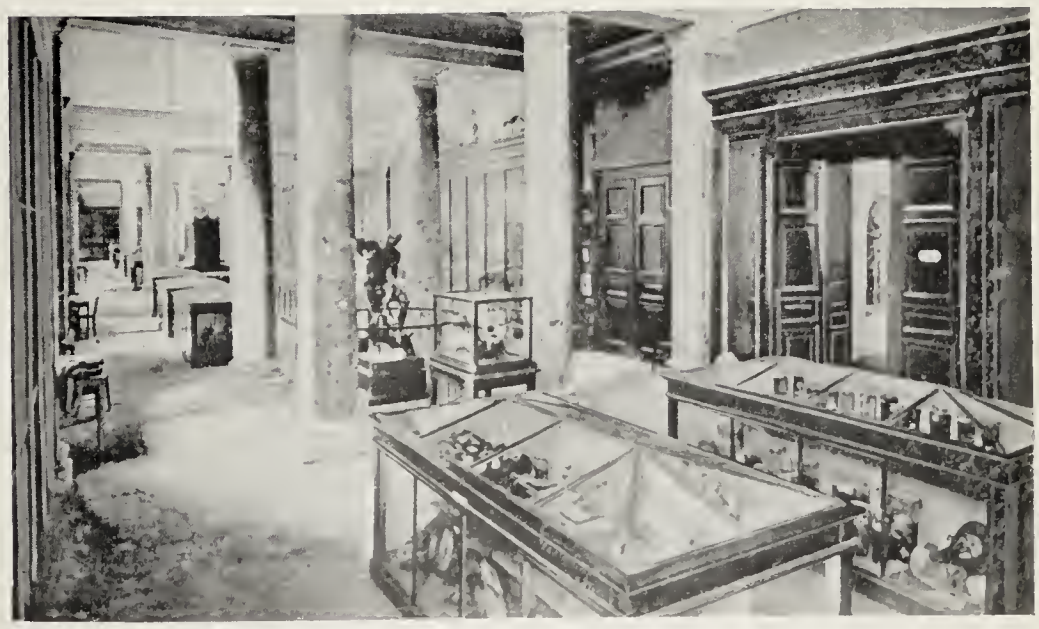


FIG. 11.—Museum of anatomy, *École de Médecine.*

FIG. 12.—Dissecting room of the anatomical theatre of the *École de Médecine.*

FIG. 14.—University of Montpellier—Interior of the court.

FIG. 13.—General view of the *École de Médecine* and of the adjacent Cathedral.

FIG. 15.—General hospital at Montpellier.

From Montpellier there sprang the great influence of Arnold of Villanova that helped so much to overthrow the scholastic forms of thought and set medicine on the firm basis of experiment, observation and conclusion, and this is one of the greatest glories of the school. Throughout the ages while other universities, notably that of Paris, were enchained in the dogmatism of the distorted Galenism which had reached them, Montpellier showed a tendency to a broader, freer, more independent thought. Her graduates are practical men, not mere philosophical theorists. This was shown in the anti-galenist struggles of the sixteenth century when the new doctrines found more ready entry at Montpellier than at Paris. The same may be said of that later period when the ideas of vitalism began to sway medical thought and found there in the south a sturdy champion in Barthez. Long may it continue in this liberal way and long may its graduates look with pride backward upon the honorable history of the school of Montpellier.

Note.—Figs. 1-5 are photographs taken in the summer of 1907; the others are from post cards bought in Montpellier.

III. DR. ELISHA NORTH, ONE OF CONNECTICUT'S MOST EMINENT MEDICAL PRACTITIONERS.*

By Walter R. Steiner, M. D., Hartford, Conn.

Formerly House Medical Officer, The Johns Hopkins Hospital.

Nestled amongst the Litchfield hills, in the northwestern portion of Connecticut, lies the little town of Goshen. It had formed a part of the "Western lands," or the sparsely settled territory of the State until May, 1738, when the Assembly passed an act, providing for the sale of the township, "which is hereby named and shall forever hereafter be called and named Goshen." The land of the town was then separated into fifty divisions, to be sold to the highest bidder, and found ready purchasers in the capitalists of that day and the younger sons of large families.[1] Here, six years later, came Joseph North, the grandson of John North, the emigrant, to found a home for his family.[2] It was this bleak, cold, yet fertile region for which he had exchanged Northington (now Avon), his former residence, but here, at the age of forty-eight, he prospered, and taught his sons how to follow the occupation of their ancestors and become efficient farmers. The eldest, Joseph Jr., was eight years old, at the time of this migration. In 1770 this son married Lucy Cowles, of Farmington, and had by her nine children. Although farming was his chief life work, yet he had a true love for medicine. He is recorded to have spent some time with Dr. Joel Soper, a local doctor, from whom he acquired his knowledge of medicine and surgery. In the setting of broken and dislocated bones he is said to have had great skill, and his practice was quite extensive for many years.[3] These tastes were inherited by three of his children, the eldest of whom forms the subject of our sketch.

Dr. Elisha North was born in Goshen on January 8, 1771.[4] Reared in this chill and drear spot he soon gained a ruggedness of health, which was of great assistance to him in his trying career of a country doctor. At the age of sixteen, he is said to have cared for a broken leg with rare skill and success. Later, he studied medicine with his father, but feeling the limitations in this preparation for his future career, he came to Hartford and studied under Dr. Lemuel Hopkins, one of the celebrated Hartford wits and a physician of prominence in his day. Then, returning to his native town, he practiced medicine until he had gained the necessary sum to more completely equip himself for his profession. In the fall of 1793[5] (according to Bolton) he entered the University of Pennsylvania as a student, but did not stay to graduate, coming back again to Goshen. How long he remained away we do not know, but in his book entitled "The Science of Life," he refers to Dr. Rush's lectures on animal life[6] and mentions Dr. Shippen as having shown him, in 1795, in his hasty dissection of the human brain, a little thing called the pineal gland.[7] Elsewhere he states, "in the year 1794, we visited Philadelphia, on purpose to obtain the information which dissections afford.[8] In the spring of 1793, we are informed of his election to membership in the Connecticut Medical Society, then but recently organized.[9] Four years later he married Hannah, the daughter of Frederick Beach, of Goshen, and his lifework as a physician appeared to lie in the land of his birth.

Whilst living in this small country town he earnestly strove to keep abreast with the times and showed an unusual interest in medical progress. Early in his professional career Jenner's book,[10] of 70 pages with four plates, was published, enti-

* Paper read before the Johns Hopkins Historical Club, May 11, 1908.

[1] Hibbard. History of the Town of Goshen, Conn. Hartford, 1897.

[2] Hibbard. Op. cit., p. 504.

[3] Hibbard. Op. cit., p. 339.

[4] Bolton. Memoir of Dr. Elisha North. Trans. Conn. Med. Soc. Hartford, 1887, p. 135 and ff.

[5] Bolton. Op. cit., p. 136.

[6] North. Outlines of the Science of Life. New York, 1829, p. 79.

[7] North. Op. cit., p. 65.

[8] North. Op. cit., p. 139.

[9] Reprint of the Proceedings of the Conn. Med. Soc. Hartford, 1884, p. 14.

[10] Jenner, Edward. An inquiry into the causes and effects of the variolæ vaccinæ, a disease discovered in some of the western counties of England, particularly Gloucestershire, and known by the name of the cow-pox. IV, 75 pp., 4 pl. 4°. London, S. Low, 1798.

tled: "An Inquiry into the Causes and Effects of Variolæ Vaccinæ." Its advocacy of vaccination, however, found but few who were convinced of its value. In the spring of 1800 vaccination was introduced into this country by Waterhouse, of Boston and James Smith, of Baltimore, who endeavored to prove in their respective towns the truth of Jenner's assertions in regard to vaccination. North had read and pondered much over this subject, and discerning its importance, made a trip to New Haven—a distance of nearly 50 miles—to obtain "some vaccine fluid warm and fresh from a person there."[11] This patient had been vaccinated with material obtained from Dr. Waterhouse, six or seven days before. With this virus North vaccinated three persons, on his return to Goshen, two of whom were children. The adult was not successfully vaccinated, but the children had good "takes," and did not succumb to variolous inoculation. This success North attributed to chance as no one then knew, not even Dr. Waterhouse, the time for taking virus. Generally it was thought, North says, "that the physicians had merely to obtain the virus, use it on a few persons, then put them to the test of variolous inoculation, in order to convince the public of the utility of vaccination and afterwards to propagate the kine-pox at pleasure."[12] That such, however, was not the case, the following unfortunate incident proved. Dr. Jessie Carrington, who was also conducting experiments in the "vaccination business," and whom North candidly calls "my rival in business," procured some virus from a traveling person, elsewhere styled a "kine-pox pedler." With it he vaccinated his wife and others, and later, when he supposed his wife was through with the kine-pox, he induced her to have variolous infection put into her arm. "Thus the unfortunate and believing wife, wishing to convince an incredulous public of the utility of the new practice, fell a victim to smallpox and was obliged by law to be taken to the smallpox hospital at Cornwall, about 10 miles distant."

Later, the time for taking the virus, to cause a successful vaccination, was discovered and gradually the genuine "takes" were learned to be distinguished from the spurious ones by both Dr. North and Dr. Carrington. The former information North received from Dr. Waterhouse, who had obtained it shortly before from Dr. Jenner. It was to "take the fluid for vaccination on or before the expiration of the eighth day." North calls this a golden rule, and would add this other, "which is not generally known or attended to; at least the proposed rule is not taught in medical books: Form patients into classes or companies. Such classes may be larger or smaller as may be convenient. Then, when one in a given class is made to have the vaccine pustule, take virus from said pustule, according to the above golden rule, and vaccinate the remainder of said class, with such virus, while warm and fresh from such a pustule."

[11] North. A Treatise on a Malignant Epidemic, Commonly Called Spotted Fever. New York, 1811, p. 2.

[12] North. Outlines of the Science of Life. New York, 1829. This account is taken from Chap. VIII, entitled "An History of Vaccination", p. 167 and ff.

In May, 1801, a patient came to North complaining of chills, headache and fever. On examination a swelling under his arm was found and a sore on his hand, which proved to be a cow-pox pustule, the patient having contracted it by milking the udder of an infected cow. This was undoubtedly the first example of the vaccine disease or kine-pox being found among the cows of this country. From this patient North successfully vaccinated a little girl and later used the virus from the arm of this girl to vaccinate a man named Hunt, who subsequently went to New York on a business trip. Thus, North declares, the first genuine kine-pox, ever introduced into the city of New York, originated from an American source. Hunt, on his arrival in New York, was sent by North to Dr. Edward Miller, joint editor with Dr. S. L. Mitchell of the Medical Repository, and one of Miller's letters to North is still extant.[13] It reads as follows:

NEW YORK, 30th April, 1801.

SIR,—I have received by the favor of Mr. Lyman, the letter and enclosures which you have obligingly transmitted to me. Your opinions and practice in respect to cow-pox seem to have been formed in the most judicious and accurate manner; and I cannot but congratulate the district of country which makes up the sphere of your professional labors, on the discernment and ability you display in the introduction and encouragement of such a means (for it scarcely deserves to be called a disease) of preventing and exterminating one of the most terrific distempers, when not mitigated by inoculation, that ever afflicted the human race.

The discovery of cow-pox must undoubtedly be considered by all intelligent and reflecting persons as one of the most interesting discoveries which distinguish the present inquisitive and enlightened period.

Our failure in the propagation of cow-pox in this city was solely owing to the spuriousness of the matter employed—a disappointment which seems often to have happened in different parts of Britain till physicians became experimentally well versed in the peculiar appearances of the genuine disease. Such occurrences, however, will probably become less frequent as soon as the community, and especially medical persons, are thoroughly apprised of the sources of fallacy and of the necessity of giving strict attention to all the circumstances of discrimination. I think your publications very properly adapted to guard against the mistakes incidental to this new practice.

I am greatly obliged to you for the kindness of sending some of the vaccine matter. I shall employ it without delay, and if it should fail to communicate the disease, shall take the liberty of requesting a further supply with view to another trial.

Wishing you every degree of success in your meritorious exertions to extend the usefulness of this discovery, and to improve the condition of the science of medicine, I request you to accept my assurances of the most perfect respect and esteem.

EDWARD MILLER.

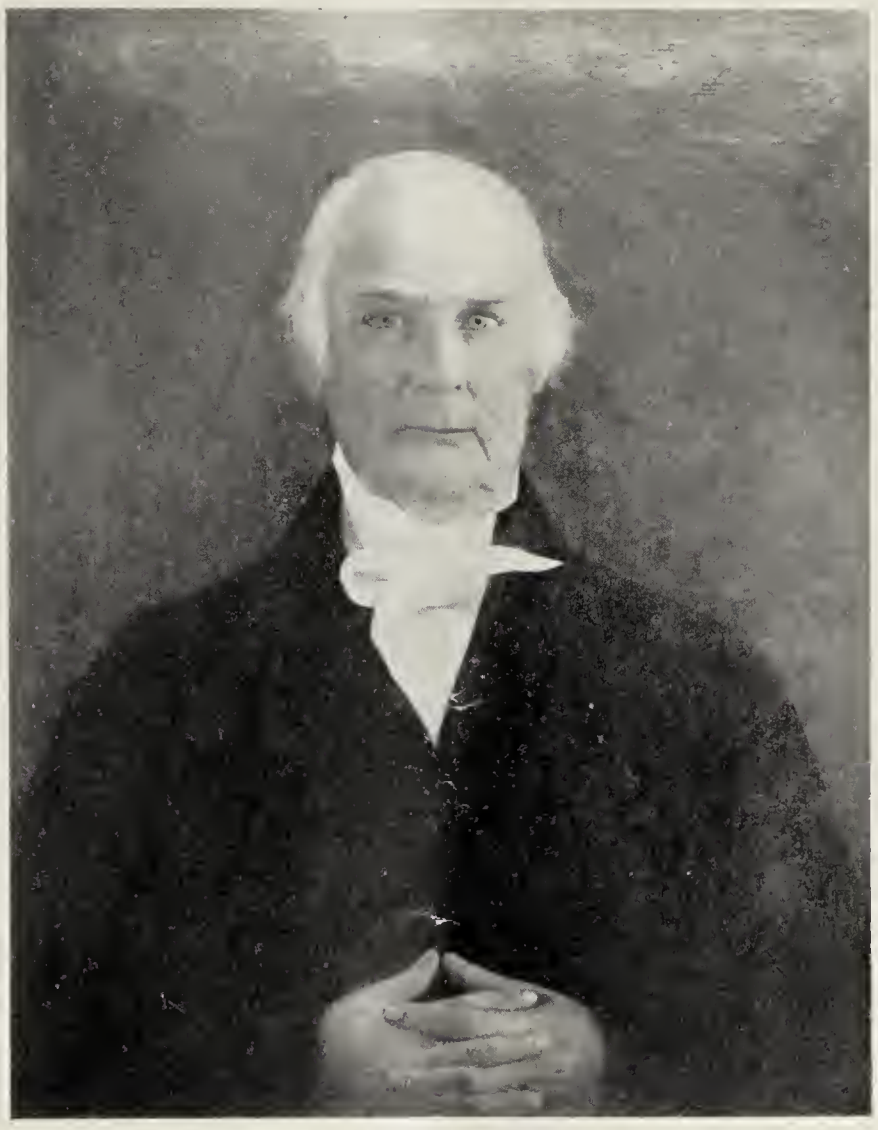
DR. ELISHA NORTH, Goshen, Conn.

During these years North claims "we thought it our duty in Goshen to exhibit much demonstrative evidence with respect to the utility of vaccination, and we regarded the exhibition of such convincing evidence with respect to the utility of vaccination as then being an important part of our business." He blames Dr. Waterhouse for not furnishing suitable and convincing evidence of the benefits of vaccination, other

[13] Bolton. Op. cit., pp. 140-141.

than in his own family. Yet, in spite of North's labors, much opposition to vaccination developed in Goshen. The residents were not convinced of its usefulness, "for there are too many people in common society who know no difference between demonstrative evidence and mischievous reports." North was accused of using, on design, bad smallpox matter. This was based on the fact he used variolous infection as a test upon such of his patients as chose thus to be tried, feeling, he says, "no law of the State was violated, unless I actually communicated the genuine smallpox."

To silence such slander he begged five of his vaccinated patients to visit with him a smallpox hospital at Winchester, eight miles distant, and there be inoculated with warm variolous infection, and likewise see the smallpox for themselves. This was done, as some maintained kine-pox was worse than smallpox. The experiment succeeded and the community was satisfied. Unfortunately, however, "another trouble arose in the progress of this business." "After we had succeeded with much labor and expense in establishing the utility of vaccination, too many thought that they could vaccinate themselves, after they had learned how from us; and such persons doubtless thought it was perfectly a fair game to defraud their teachers of the pitiful fees which were expected." Consequently Dr. North and Dr. Carrington completely failed to make the business of vaccination profitable, notwithstanding their great attention.



It must be stated, though, that North's labors were appreciated by some of his fellow townsmen, for on February 6, 1811, the four selectmen of Goshen state, in an advertisement in the *Connecticut Courant*,[14] that "Dr. North was one among the first who made a vigorous attempt to introduce into this State the use of the cow-pox. Ten years have elapsed since his efforts for this purpose was commenced. The cow-pox, like all other new discoveries, met for a considerable length of time with the most determined opposition. The time has, however, at length arrived in which almost every one acknowledges its utility." Then follows this statement of Dr. North's, which refers to his method of vaccination previously mentioned:

> The subscriber informs the people in the adjacent towns, that he will with pleasure extend his practice of vaccination to any distance within a convenient day's ride from his usual place of residence. As he always prefers to use fresh infection it becomes necessary to communicate the kine-pox to numbers at the same time. This method of management is also peculiarly calculated to reduce the expense to each individual to a very moderate sum. The subscriber will with promptness and gratitude attend at their own places of abode to all such classes as may apply to him for the purpose of receiving the cow-pox. As vaccination from its very nature can never be an object worthy of the attention of every physician, the subscriber contemplates that those of his medical brethren who may not choose to engage in this practice will not consider this attempt to extend its benefits as an infringement on their medical rights and privileges.
>
> [Signed] Elisha North.

In 1807 a new and peculiar disease, spotted fever or epidemic cerebro-spinal meningitis, demanded North's attention. It had come upon Goshen "like a flood of mighty waters, bringing along with it the horrors of a most dreadful plague,"[15] its first appearance in the State being at Winchester on April 10, 1807. The malady completely mystified and baffled all the physicians who tried to cope with it; they found difficulty in giving it an adequate name; they were unable to classify it; they were at variance as to its best methods of treatment. The Federalistic physicians proclaimed the virtues of depleting or evacuating the system, in this affection, by calomel and venesections, while the Democratic physicians pinned their faith in the use of stimulating remedies, some of them being most lavish in this particular. For instance, Dr. Bestor, of Simsbury, gave one patient two quarts of brandy and one quart of wine in 24 hours:[16] Dr. Elijah Lyman, of Torrington, and subsequently of Farmington, gave in seven hours five drachms of the essence of peppermint, half a drachm of gum camphor, two ounces of brandy, and a pint

[14] Bolton. Op. cit., p. 159.

[15] North. A Treatise on a Malignant Epidemic, Commonly Called Spotted Fever. New York, 1811, p. 2.

[16] North. Op. cit., p. 79.

and a half of wine:[17] Dr. Samuel Woodward, of Torringford, gave wine and ardent spirits to produce a degree of intoxication, noting they never appeared to do any injury:[18] Drs. Haskell, Spooner and Holmes, of Petersham, Mass., gave to one patient, 20 years old, one quart of brandy in 12 hours, besides external stimulants,[19] and Dr. Nathan Strong, of Hartford, gave in eight hours one quart of brandy.[20] Small wonder then is it that North states "it is not to be denied that the use of stimulants has been abused in the treatment of our epidemic," and this statement comes from one who was a stimulator himself in this disease. However, he declares he does not mean that "in every case patients must take brandy by quarts or wine by gallons, for I believe that it requires as much judgment in using stimulants as it does in reducing the system."[21]

His experience with the malady was very extensive, and his treatment most successful. Eventually most of the physicians employed the stimulating method largely as outlined by North in his letters to President Ebenezer Fitch, of Williams College, in 1808,[22] Dr. Elijah Munson of New Haven in 1809 (in this letter he first calls the disease Typhus Petechialis),[23] and in his book, which appeared in 1811. In 1810 Dr. Timothy Hall of East Hartford, in a paper on Spotted Fever, before the Connecticut Medical Society, said that "Dr. North's method of practice coincides more with my own ideas of the proper method of treating this disease than anything I have seen written on the subject."[24]

During 1808 North treated 65 patients with this disease and only lost one, while of six others, in Goshen, who died of it, four were under the care of other physicians. Elsewhere he states: "I have myself treated more than two hundred patients with this disease; of these I have lost two."[25] His treatment consisted in giving an emetic, generally ipecac, at the commencement of the complaint, if there were no symptoms immediately alarming. This was followed by a cathartic of senna, rheubarb or some other mild purge, which was done, as a "preliminary treatment to prepare the stomach and bowels the better to receive medicines." "While this is doing," he applies a blister to the nape of the neck, as he has found it will frequently remove the headache, and then he gives elix. paregoric or tinct. opii, in sufficient doses to ease pain and remove distress. Also gum camphor is prescribed as well as elix. vitriol, native acids and a half-pint to a pint of wine daily. He, likewise, frequently adds a tea of Virginia snake root and Peruvian bark. He keeps the patients' feet warm with sinapisms or bottles of warm water, and applies blisters occasionally. He gives the patient as much food as his stomach will best bear. Now and then he varies his medicines and orders tinct. Huxh., tinct. castor com., ess. menth. pep., spts. lavend. com. and other drugs. For a common drink he uses warm teas of sage, pennyroyal, hemlock or rob. of elder. If, however, he is called to see a patient in the sinking state of fever, he immediately sets to work with stimulants externally and internally. He puts the patient to bed, having first bathed his feet in warm water; applies blisters to the nape of his neck and gives tinct. opii., hot brandy slings, heated wine and warm teas. He, also, applies hot brands from the fire quenched in water and wrapt in clothes near the patient in bed. In some cases essence of peppermint, tinct. castor com., camphor and other remedies are prescribed, taking care not to crowd the stomach to excite vomiting. By this treatment he finds the patient generally is "relieved as soon as he grows warm: not always, however, until he sweats." He adds: "I do not suppose the cure depends upon the mere flowing of the sweat, but upon the effects of the stimuli used for exciting the sweat. Still I consider the sweating is useful, it being a kind of medical thermometer, to enable us to know when the degree of stimuli has been carried sufficiently far in bad cases."[26]

With commendable care North sought to acquaint the public with this new and dread affection by giving in book form not only his own views upon it but also those of Danielson and Mann, who first saw the disease in this country, and the views of Lyman of Torrington and Farmington, Woodward of Torringford, Bestor of Simsbury, Fiske of Worcester, Williamson of Baltimore, and others who had wide experience with it. In the appendix, he gives the detailed history of eight patients, two of whom had had the disease twice, and, also, inserts a translation of the first desciption of the disease as it appeared in Geneva, during the winter and spring of 1805. The book was published four years after the malady was first observed in this country, and is indeed a little classic, which is now hard to procure. In it North considers the disorder a form of typhoid and gives the pathognomonic symptoms as pain in the head, soreness of the throat, white tongue, weak pulse and great prostration of strength. He does not consider an increase of temperature of the body and an increased frequency of the pulse as prominent symptoms.[27] He, also, gives most of the symptoms that have been noted in connection with the disease, including the joint affections.[28] The eruption was commonly seen during the first year of the epidemic, but later was more rarely observed. We very much regret he never published the second edition of this book, which he planned to print some thirty years later, along with Dr. Nathan Strong's Dissertation on Spotted Fever, Dr. Thomas Miner's pamphlet on that subject, Dr. Samuel B. Woodward's essay and two others by Hon. Benjamin Vaughn, Esq., of Maine, and Dr. Henry Fish.[29]

[17] North. Op. cit., p. 80.
[18] North. Op. cit., p. 116.
[19] North. Op. cit., p. 79.
[20] North. Op. cit., pp. 79-80.
[21] North. Op. cit., p. 138.
[22] North. Op. cit., p. 98.
[23] North. Op. cit., p. 126.
[24] Reprint of the Proceedings of the Conn. Med. Soc. Hartford, 1884, p. 314.
[25] North. Op. cit., p. 67.
[26] North. Op. cit., pp. 132-137 (inc.).
[27] North. Op. cit., pp. 17-18.
[28] North. Op. cit., p. 15.
[29] Bolton. Op. cit., p. 146 and North: Outlines of the Science of Life. New York, 1829, p. 203.

In 1812, when North was 42 years of age, he was invited to remove to the city of New London. The offer was one he could not refuse so we find him on July 1, 1812, offering his services to the citizens of New London, as a practitioner in physic and surgery, in an advertisement in their journal, the *Connecticut Gazette*. He, also, there states that, "having lately been informed it was understood he did not intend to practice midwifery, he now takes this opportunity to inform the public that he will as readily attend on calls of that description as any other; also, that he has been much experienced in that part of his profession for twenty years past." [30]

Seven years later he advertises again in the same journal, appealing to physicians, clergymen, selectmen and others, whose duty it is to take the lead in society where sickness is concerned, and four New London physicians endorse the publication as one which will probably benefit society. In the advertisement North mentions his new method for performing lithotomy for stone in the bladder, and his catheter for cases of retention of urine, "by the use of which no person in the future need necessarily die from that cause alone." He proclaims he has "acquired experimental knowledge in the treatment of permanent urethral strictures by the caustic bougie and can give correct advice and furnish the most improved trusses for ruptured persons." Finally he adds: "I have had the pleasure to prevent total blindness and restore sight to twelve or thirteen persons during the last three years. These would now probably be moping about in total darkness, and be a burden to society and to themselves, had it not been for my individual exertions." [31]

His skill and interest in this last specialty, ophthalmology, had caused him to open an eye infirmary in New London in 1817, which was the first institution of its kind in this country. Elsewhere he writes: "We had attended to eye patients before that time, but it occurred to us then, that we might multiply our number of cases of that description, and thereby increase our knowledge, by advertising the public in regard to an eye institution. This was done, and we succeeded; although not to our wishes in a pecuniary view of the case. Our success or exertions probably hastened in this country the establishment of larger and better eye infirmaries (*i. e.*, for larger cities)." [32] North appears to have been especially proud of his work in this line, for on the title page of one of his books we find under his own name the words "conductor of an eye infirmary." [33] The following anecdote well illustrates the need of such an institution in New London. It is related that a patient came to North with an inflamed eye. The doctor discovered the cause of the inflammation was due to some foreign substance and successfully removed it, prescribing the application of some soothing lotion, before the patient's departure. As he left, North asked him what he had been doing for his eye. The man replied that he had been to Dr. Blank. "Ah," said North, "and what did he do for you?" "He gave me thirteen doses of calomel," the man begrudgingly replied. And when we remember that the usual dose in those days was from 5 to 15 grains, we have a fellow-feeling for this patient, on account of the venom he displayed against his former doctor.[34]

North's life in New London was indeed a busy one. His work as an oculist, as a surgeon and as a general practitioner gave him little time for leisure, yet he remained a student to the end of his days, and seemed to realize with Plato that education was a life-long business. Consequently, he strove "to gain encouragement in his day's work and a betterment of mind and method" by joining and taking an active part in the New London County Medical Society, which he served as clerk in 1815 and as chairman in 1823 and 1831.[35] He was, also, active in the work of the State Medical Society, which conferred upon him the degree of M. D. in 1813.[36] He was, frequently, a delegate to its annual meetings and served on some of its committees. In 1824, probably desiring to gain more rest and recreation, he removed to a farm at East Lyme, driving in each day to New London to see his patients. It was while he was on this farm that he found some peat, which caused him to have large ideas about its use as a fuel. These he exploited in an article in the American Journal of Science.[37] After a few years he returned again to New London and lived there until his death at the age of 73, on December 29, 1843. His family consisted of a wife and six children; two daughters and four sons. Three of the sons were named Harvey, Erasmus Darwin and William Heberden,[38] showing their father's love and reverence for some of the illustrious names in his profession.

In practice he is said to have "exhibited a remarkable degree of caution, deliberation and careful reflection. When concerned with the health and comfort, and we may add the moral welfare of his patients or friends, he exercised a conscientious care and thoughtfulness that preserved him from unsafe enthusiasm or dangerous and extreme views. As a counseling physician he enjoyed the confidence and friendship of his brethren, and was much valued for his philosophical habits of mind in cases of difficulty and uncertainty." [39]

His quaint, dry humor is still preserved in a few surviving anecdotes. This is, also, well illustrated in his writings. Some of the stories, still extant, record his absent-mindedness. It will suffice to quote a few instances.

On one occasion a young girl came into his office on account of some trouble in one of her feet. As she hesitated to bare her foot and show it to him, he became much incensed at her false modesty and finally blurted out: "Madam, if your foot is clean, let me see it." Her scruples are said to have immediately vanished.[40]

On another occasion, one of his children, when quite young,

[30] Bolton. Op. cit., p. 160.
[31] Bolton. Op. cit., p. 160.
[32] North. Op. cit., pp. 89-90.
[33] North. Outlines of the Science of Life. New York, 1829.
[34] Bolton. Op. cit., pp. 150-151.
[35] Bolton. Op. cit., p. 149.
[36] Reprint of the Proceedings of the Conn. Med. Soc. Hartford, 1884, p. 179.
[37] On Fuel. The Am. J. of Science and Arts, 1826, XI, pp. 66-78.
[38] Bolton. Op. cit., p. 154.
[39] Bolton. Op. cit., p. 148.
[40] Bolton. Op. cit., p. 155.

swallowed a pin and came in great distress to her father, exclaiming: "I've swallowed a pin." Dr. North, barely looking up from his book, quietly said: "Well, does it hurt you?" "No, father," said the child. "Then don't be so careless again," was the laconic reply.[41]

Resembling many others in his profession, he was a bad bill collector. After his death the following was found in his ledger:

"Mr. Blank, to doctoring you till you died $17.50."[42]

At another time when his house was on fire, a neighbor called out to him, "Doctor, your house is on fire." He is said to have made no reply but to have quietly walked into his house. Seeing him so cool, a bystander asked his neighbor and intimate friend, Judge Lyman: "What do you suppose the Doctor is going to do?" "Doubtless," answered the Judge, "he will consult Count Rumford's works to ascertain the best means for extinguishing fire."[43]

I quote the following illustrations from his writings:

Referring to the appetites he states: "The stomach, like a wife, has more power at home than any other organ in the whole family of organs and parts; and it should be so for the whole animal mass is very dependent on this very important part."[44]

In mentioning the functions the different organs perform, he declares: "the stomach and digestive apparatus has the most perpetual and needful power, but the human brain, like an husband, has immense power over other animals and things, as well as at home."[45]

Speaking of the social principle of an individual which may be moulded by education or through habit and fashion, he writes: "Among mankind the men pretend in private life to govern the women and the children; but both the latter often rule the former and often to the injury of society."[46]

Elsewhere we read: "The body can be altered and sometimes be improved, by physical power, as well as the mind, by education, or by moral causes. When an infant's club-foot is made by the surgeon to grow naturally, or to assume a proper shape, every one will agree that an improvement is made; so, when the human beard is shaved off, many think a person improved, or made to look better in the eyes of others. The human head can be made in infancy, to grow square or long, according to the fashion which prevails in some places. A woman's foot can be made to be small as it is done in China; and the body of a lady can be made to resemble, in shape, that unpleasant insect, the wasp, as is now very unfortunately the unwholesome fashion even in this highly-civilized country. We hope to be excused by the ladies, for we mean them no harm."[47]

In another of his publications we learn that "mankind is full of wonderfulness; it is not, however, always necessary to have a big head to command attention, as some writers ably teach; not that I myself have a small head."[48]

By his contributions to medical science North has left a reputation behind, which the succeeding years cannot blight. Although not a man of the genius of Nathan Smith of New Haven, yet he was, in truth, of large mould. His books and articles are all well worth reading. In Bolton's bibliography of his writings we find 12 titles. Nine of them represent papers in the different daily and medical or scientific journals of that day. In one of them he describes his operation for lithotomy by the posterior method, with the patient placed upon his abdomen, and when we remember that there were no anæsthetics in those days, the position appears to have been a judicious one, for "the patient had the power of closely embracing a solid substance (the operating table) and could be firmly secured upon it, if necessary."[49] Another paper is of interest as an epidemic of typhoid fever in Goshen, during 1807, is there detailed.[50] In it we find North was opposed to the use of stimulants, in the early days of the disease. The remaining subjects in Bolton's list include Hydrocele Capitis Infantum, Cyanche Traehealis, two letters on epidemic cerebro-spinal meningitis, fuel, the rights of anatomists vindicated and phrenology. North's other literary remains consist of three books, one of which on spotted fever has been already discussed. The other two were entitled, Outlines of the Science of Life and the Pilgrims' Progress in Phrenology. The first volume, also, contained six essays, which had been previously printed. The one on the history of vaccination as practiced in Goshen has been already considered.

North wrote the Science of Life, as a philosophical farmer on the one hand and a practical physician on the other, to prove that the phenomena of vitality or sentient spirit, which is found in animals and plants, is formed by caloric either from the blood of animals or sap of plants, and that every sort of life as well as every function of life is dependent upon such a spirit. Consequently, no unknown spirit or immaterial nonentity need be presupposed to explain the phenomena of vitality. He realized that a very few only of such beings, even among those that are rational, can be expected to learn this doctrine, and some must be expected to oppose it, as they did phrenology, without understanding it. He claims, however, the merit to have shown that the halitus of the blood is the hidden prineiple of vitality, instead of its originating, as a gaseous or spirituous principle, directly from the brain, as Darwin contended. Thus he reasons, the circulating blood is the seat of the main prineiple of life, and maintains that further experiments and observations, to support this, are un-

[41] Bolton. Op. cit., p. 155.
[42] Bolton. Op. cit., p. 155.
[43] Bolton. Op. cit., p. 156.
[44] North. Outlines of the Science of Life. New York, 1829, pp. 152-153.
[45] North. Op. cit., p. 59.
[46] North. Op. cit., p. 61.
[47] North. Op. cit., pp. 74-75.
[48] North. The Pilgrims Progress in Phrenology. New London, 1836, p. 68.
[49] North. An attempt to demonstrate that the bladder may be opened for the extraction of stone, by a posterior method of operating, more conveniently to the surgeon, and with much greater to the patient, than by any other method hitherto discovered. N. E. J. of Med. and Surg., 1822, XI, p. 113.
[50] North. Account of the Typhus Fever and its Treatment. Phila. Med. Museum, 1808, IV, p. 16.

necessary. Although his ideas appear materialistic, yet he claims he is also a mentalist and does not deny the power of God to make the human soul immortal, agreeably to the Christians' faith and hope.

The book is extremely discursive, abounds in quotations from Pope and contains a quaint collection of pithy epigrammatic sayings, yet it becomes, occasionally, monotonous, for, as he truly confesses, to make an impression we may have been sometimes faulty in a repetition of ideas, at least, in the opinion of some. He begins his book with an epitome of vitality which is followed by a preface, a table of contents, an introduction, an address in vindication of the book, and a chapter on the State of Physiology and Metaphysics during the last half century. Finally, after this digression, he begins his subject on the forty-sixth page, and continues it for about 62 pages. He shows an extensive knowledge of the state of physiology in his day, and evidently must have been an omnivorous reader, as he quotes Darwin, Servetus, Abernethy, Rush, Bichat, Gall and Spurzheim, Le Gallois, Broussais, Bostock, Good, John Hunter, Thomas and John Brown, and others. In a foot-note, he shows he is familiar with Beamont's experiments on Alexis St. Martin.[51] North thought the book would give "most pleasure to the aged, yet it is to be hoped that the work will be read by the young." "Little emolument, however, was expected from it, though the writing of it had increased his power as a practical physician, but whether it would benefit readers time must decide." A small edition as published, as he "wished to make his nucleus of physiology or science of life useful to medieal men if not to politicians" and, although the market was so glutted with foreign physiologieal books, he hoped for a small share of domestic patronage, at least for an original work. Ten respectable physicians had examined his manuscript of this book, and nine had written certificates in favor of its publication.

His essays on the Rights of Anatomists Vindicated are reprinted here and were written to show the great mischief the public law of 1824 would cause in Conneeticut, whieh made the procuring of dead bodies for purposes of dissection very difficult. They are written in North's inimitably quaint style and strive to prove the necessity of disseetion to maintain the superiority of modern surgery over the ancient. The business, however, should be done privately. "By this means the surgeons aequire dexterity in operations, and, consequently, the living are not liable to be injured by ignorant and unskilled surgeons and the dead the surgeons cannot injure." It is the living and not the dead who require, on their own aecount, protection. Those who dissect the human body have a claim upon the protection of the law as well as other citizens, provided they eonduct their business with decorum and propriety. But, on account of the above law, it will be impossible for the surgeons to qualify themselves for their specialty, as malpractice suits may be their lot, on the one hand, if they are unskilled, or a criminal's sojourn in Newgate prison, on the other, if they take the means to become acquainted with the different operations upon the dead body, whieh they might subsequently have to perform upon the living. "Are there not enough of those," North asks, "who have been useless, and worse than useless while living, that can be made useful when dead?" Besides there is nothing in the Bible against disinterment or dissection.

In fact, he happened to "know of several persons who were as innocent of the real crime of real felony as a child unborn, who had been caught in the meshes of the cruel laws of this country, in relation to anatomy. The last of these, after lying in the county jail many cold winter nights was, by the powerful aid of highly respeetable friends, with much diffieulty and expense at last saved from suffering the penalties of the State prison for 10 years as the case might have been. This person, consequently, wisely concluded, if such were some of the evils of the mysterious or secret art of surgery, to quit the business; and the next we heard of him he was calculating to become a seafaring man."[52]

North suggests that dead bodies be purchased directly from certain well-disposed relatives or their substitutes, previous to or after inhumation, and admits that he once procured an anatomical subject in such a way, and without price, from a very respectable and pious person. He, also, proposes the advisability of buying an uncertain privilege of a person who should agree to remain ignorant of what the surgeon might do, in relation to a particular dead body, and thus painful feelings might be diminished. Again, surgeons might ask the favor of a living friend, the privilege of performing a single surgical operation or partial dissection for their own improvement, and admits having sometimes done so himself, even before inhumation. But, if the body is disseeted before inhumation, great care should be taken to ascertain that the person is completely dead! In fact, to be absolutely sure, it is better to obtain dead bodies by inhumation and so avoid the possibility of dissecting a living person. Finally, he wishes it understood that, on aecount of his advanced age, he has no personal interest in inhumation or dissection.

I have been unable to get more than a fleeting glance at North's book or pamphlet on Phrenology. He was long interested in this subjeet and probably heard Spurzheim lecture upon it, at New Haven, during his American visit, in 1832. The book seeks to give instructions in this science, in the mode of a pleasant conversation, in a mixed company of gentlemen and ladies.

Besides being known as a writer and man of mark, North is also distinguished for having invented four forgotten surgical instruments—an improved trephine, an eye speculum, a trocar and a new form of catheter. The first two were exhibited before the State medical society in 1821, and the last two had the endorsement of four New London physicians.

The life and writings of Elisha North were well portrayed by his grandson, Dr. H. Carrington Bolton, in 1887, but as this pamphlet is now quite scarce, I have been induced to bring him again before the public as a physician unworthy of the present ignorance concerning his life and works.

[51] North. Op. cit., p. 53.

[52] North. Opp. cit., p. 158.

IV. THE PSYCHIATERS AND PSYCHIATRY OF THE AUGUSTAN ERA.[1]

By Smith Ely Jelliffe, M. D., New York.

When all roads led to Rome, all roads brought from Rome, even to the farthest coasts, rumors of the life of the city, expressing the envious, restless, ambitious spirit that pervaded its men of action; the spirit to which Julius Cæsar yielded when he let the coveted crown be placed on his head; the spirit that permitted the stern ideals of the Republic to sink into the greed and graft of an Empire ruled by favorites.

When, as alienists of to-day, we read, in the headlines of the morning dailies, brief notices of divorce, murder, and suicide, we can construct, from our own professional experiences behind the scenes, a picture of the insane hatreds, the depressions, the possessing phobias of disgrace that have led to these unbalanced acts.

The daily papers, with all their power of penetrating to the farthermost parts of the country, are ephemeral indeed, when compared with the enduring power of the gossip of Rome. Though scandal and disaster depended on word of mouth, or parchment and stylus, for its dissemination, so robust were these scandals that they survived, not only long enough to reach Egypt, Asia, and Gaul, but even to come down to the present day.

Picture to yourselves the excitement that thrilled Rome and stirred Augustus' armies to action, when it was known that Mark Antony had divorced his second wife, the Emperor's sister, and had married Cleopatra. Fancy the discussions in the Forum when Cicero hurled his Phillipics at Antony's debauchery and fondness for low company; and imagine the mixture of applause and disgust when Antony's book in praise of drunkenness was talked over in the baths; the dismay when Cicero paid with his head the price of speaking his mind; and then, greatest excitement of all, when after being defeated at Actium, Mark Antony stabbed himself, and Cleopatra, unwilling to be led captive in Augustus' triumphal procession, laid the historic asp in her bosom.

In the age of which we speak to-night, the age in which Julius Cæsar conquered, and Augustus and Tiberius ruled, we have every evidence that human nature reacted to the emotions of anger and shame, to jealousy and fear, as surely and as violently, if not more so, as at the present day; therefore, we are justified in thinking that the mental balance of those subjected to the action of strong emotions was as easily upset then as now; that drunkenness was followed by similar brain changes and that debauchery and excesses led as often to mental deterioration, paresis, and dementia. It is an easy transition from the modern prison cell, where we find mental disorder in from 25 to 50 per cent of those accused of crime, to the streets of ancient Rome, where given like circumstances and like crimes, we suspect like insanities.

But, leaving historical glamour out of the question, we have data to deal with; rather dry fragments, I admit, but as the archæologist, poring over a few bones, can vouch for the fact that a mighty Brontosaurus once walked that way, in just such a hide, and in just such a forest, so I, presenting a few scattered facts to you to-night, dare affirm that in the Augustan Age, there existed certain fairly well recognized forms of mental disease, and many more unrecognized insanities.

My authorities for these are fragments of Horace's satires, and Lucretius' poems; excerpts from Cicero, and the vehement Pliny; and one regular thigh-bone of archæological medicine —the eighteenth chapter of the third book of Celsus' treatise upon medicine, in which he writes explicitly of the insanities.

It seems that the equivalent of our words mad, crazy, cracked, and fool were employed then in exactly the same way as to-day, sometimes with medical import and sometimes in jest.

Horace is continually using them in jest. On his satirized jaunt from Rome to Brundusium, on the way to meet his pleasant friend Virgil, when the cursed goats and frogs drove off repose, and when his fellow travelers had to cudgel the mule and his driver alike, he casually mentions that without regret they "passed Fundi, where Aufidius Luscus was prætor, laughing at the honors of that crazy scribe."

We think it modernly facetious to frankly ask, "Are we not all a little mad?," and to quote the gentle Quaker who said to his spouse, "All the world is queer, save me and thee, and sometimes methinks thee is a little queer," but Horace in his third satire classifies his friends according to their types of foolishness, and says, "Who then is sound? Who then is not a fool?"

There was a saying of the day, which he addresses to the friends whose judgment he satirizes. It was to "go to Antieyra," which was the equivalent of "go to Bedlam," for Antieyra was a pleasant island on which hellebore, the favorite drug for the treatment of the insane, grew in abundance, and those who were mad were taken thither, as to a sanitarium, and dosed on the spot. The covetous man, says Horace, is both a fool and a madman, and he marvels that the whole isle is not devoted to such fellows.

But Horace refers to the insanities only in humorous allusions, and for a knowledge of the medical perception of insanity we must turn to medical writings.

From all that we can learn the ideas of Hippocrates concerning insanity were transmitted more or less without change right down to the time of the first century before Christ.

In order to appreciate in what respect our authors, of whom we shall speak, held, or departed from, the Hippocratic doctrines, I might recall to your minds, in the most general of terms, that the Father of Medicine distinguished, without specifically making a systematized classification, phrenitis, mania, melancholia, and he also spoke of dementia and paranoia. His

[1] Paper read before the Johns Hopkins Medical Historical Club, March 9, 1908.

phrenitis was practically a febrile delirium; his manias were largely miscellaneous excitements, without fever, and his melancholias were depressions no matter what the type, from which it may readily be gathered that so far as his manias and melancholias are concerned they are not in any sense to be compared with modern conceptions of mania or of melancholia. It may also be said that the psychoses of alcoholism were not unknown to him. Alcoholic epilepsy, delirium tremens, and wet brain were probably all included.

It is perhaps of some interest to note further that his word "paranoia," while at times more specifically covering dementias, was often used by him to include all three, phrenitis, mania, and melancholia, and that further the term "mania" was employed purely in the sense of insanity in general, and that "melancholia" did not always signify an insanity, but simply a type of character—the so-called "bilious temperament."

The three men who stand out as noted for their treatment of mental disease in the first century B. C. were Asclepiades, who was a contemporary of Cæsar and Cicero; Themison, his disciple; and Celsus, who lived to practise in the Christian era.

Of these let me speak, not in good set terms, for their biography is scanty, but in running comment, as scattered facts give me hints of those days.

Pliny, whose spleen against things Grecian lends delightful spice to his writings, gives us a thumb sketch of Asclepiades. He described him (1) as a professor of rhetoric who considered himself not greatly repaid by that pursuit, and whose readiness and sagacity rendered him better adapted for any other than the medical art. He wrote that he had never practised medicine, and was totally unacquainted with the nature of remedies—a knowledge only to be acquired by personal examination and actual experience—and he marvels that a single individual, and he belonging to the "most frivolous nation in the world," a man born in utter indigence, should all on a sudden, and that too for the sole purpose of increasing his income, give a new code of medical laws to mankind.

But Pliny was inaccurate in his estimate of Asclepiades, as we know him to have been in other things. Asclepiades was born in Bythnia, Asia Minor, perhaps about 120 B. C. (2), and was probably the son of well-to-do parents, as he traveled and studied while very young. Strabo (3) (the geographer) says that he came of a distinguished family, and that his father Theodosius was a well-to-do man, having three famous sons, one of whom was the orator Kliochaus, with whom Pliny had probably confused the physician. The young Asclepiades studied medicine and philosophy in Athens and in Asia Minor, and pharmacology in Parim under Kleophantes. In the course of his medical studies at Parim, we learn he became convinced that blood-letting did harm, and in his philosophic studies he became imbued with the atomic doctrines of Democritus, through his follower Epicurus, and followed the teachings of the latter in his love of open air and pleasant relaxation as a means of health and rest.

With these equipments he went to Rome at the age of twenty-four.

Although Rome might, in point of time, have benefited from the teachings of Hippocrates, yet there seems to have been, and that a hundred years earlier, only one great teacher, viz., Archagathus, before the days of Julius Cæsar. The fact that Julius Cæsar issued an edict permitting foreign physicians to practise and to teach in Rome, suggests that direct inspiration from Greece had hitherto been cut off, and the effect of this protective policy had been that, while Greece was at the height of her medical philosophy, Rome was still in the folk lore period of medicine, and was overrun by clever quacks, augurs, soothsayers, potion-makers, and old wives.

The rivalry between young and self-sufficient Rome and old and cultured Greece partook somewhat of the contempt that in the last century existed between our young republic, and the Old World constitutions, and resulted in two parties of Romans, one that was all for importing Greek customs and philosophies, and the other that emphatically stated the principle that Rome was good enough for them.

In Pliny's splenetic criticisms of all physicians, we discern the medical philosophies that then existed in Rome. Hippocrates had founded the doctrine of humors, which Galen later upheld; but Asclepiades rejected the doctrine of vital fluids, and built his theories on the atomic hypothesis of Democritus. The pores, as an outlet of the corpuscles of disease, were to be opened by baths, sweatings, steamings, and the atoms of disease thus permitted to pass off. He was the forerunner of the Methodist School, of which Themison was the high priest, and of which Galen (4), who reverted to blood-letting, sarcastically remarks that "they knew as much about methods as an ass knew of playing the zither." The treatment that Pliny ridicules (5) was Asclepiades' custom of covering up the patient with vast numbers of clothes to promote perspiration, sending the patient on a search for sunshine, and prescribing such a free use of cold water, both inside and outside, that he did not object to being called "Cold-water Asclepiades." The five doctrines of common sense which he laid down as principles for the treatment of all diseases, including insanities, were diet, the use or non-use of wine, friction, exercise on foot and exercise in a carriage or on a horse. As Pliny remarks, "Everyone perceiving that each of these methods of treatment lay quite within his own reach, all, of course, with the greatest readiness, gave their assent, willing to believe that to be true which was so easy of acquisition."

It was to such a medical public that the young Asclepiades came, and later perfected a school which, as we have seen, Pliny called "revolutionary." Interesting as his general doctrines are, we must pass them over to consider more particularly his relations to psychiatry, for it is evident from the first that he was *au fait* with matters connected with the mind.

Apuleius (6), in his Florida, has given in detail one of the striking tales of how Asclepiades first won renown and became talked about the country round. It is related that on meeting the funeral procession of a person unknown to him, he

observed that the person about to be burned showed some signs of life, and ordered the body to be removed from the funeral pile and carried home. He then placed him under treatment and the man came to himself. He thus was the means of saving the man from being burned alive. There is enough evidence in the tale I think to say that Asclepiades recognized the patient as one suffering from hysterical coma, and he took the proper means to effect a cure. This is a case preceding by perhaps one hundred years the raising of Lazarus, and indicates, I think, that, in the accumulated lore of the priesthood of Egypt, and of the philosophers with whom Asclepiades and Jesus of Nazareth in all probability studied, there had been some keen observations made upon hysteria, and that hysterical coma, or hysterieal trance, was then recognized, and was probably a not uncommon eondition. It is noteworthy that Pliny is very sarcastic about this performance, and speaks of Asclepiades as being very bold and "as playing to the gallery."

The definite writings of Asclepiades, with the exception of a few fragments (7), are lost, but scattered teachings have been preserved to us by direct quotation through Celsus, Cælius Aurelianius, Pliny, and Galen.

Of the actual insanities described by Asclepiades, we find a fairly strict adherence to the Hippocratic teachings, although we may see that distinct advanees were made by him. He tried to outline a better symptomatology, and a differentiation of types, with ideas of prognosis. Phrenitis, which, for the ancients, included those cases of fever accompanied by mental excitement, was divided into at least two groups, a phrenitis proper, which in his first book on "Aeute Disease" (8) he defines as "A standing still of the corpuscles, or else a sort of obstruction in the membranes of the cerebrum, with loss of the senses, alienation and fever," and those forms which were not phrenitis proper, but were non-febrile deliria, for he says that "not every mental disturbance accompanied by fever should be regarded as phrenitis, since such often appear with pleuritis and with pneumonia, especially at the height of the disease on the seventh or eighth day."

Absence of mind, loss of sensibility, and fever, these must be found in order to make a diagnosis of phrenitis. Then again if opium, or mandragora, or henbane (our modern morphine, scopolamine and hyoscine) had been taken there resulted a phrenitis without fever—a significant observation indicating the effect of these remedies in quieting delirium and thus reducing temperature. Asclepiades makes further another non-febrile phrenitis, but its limitations are unknown to us. He also recognized an epileptic phrensy. Lethargy was a state opposed to phrensy, also being aecompanied by fever, and probably refers to the low muttering delirium of the typhoid state.

One can readily see, I think, why phrenitis played such a prominent rôle in the psychiatry of these times when one recalls that trauma, exhaustion, intoxication, and infection must have been very prevalent. Slavery, bad food, gladiatorial contests, frequent brawls, constant warfare, forced marchings, the galleys, wearing of chains, etc., all must have contributed the very factors that would contribute to the acute toxic, infection, and exhaustion psychoses, which correspond so closely with the phrenitis of these former times.

Asclepiades further distinguished a mania, or state of continuous exeitement without fever (9), but makes a keen observation that in one group the patients recognized things, but made mistakes about them (this he says was known to the poets, "as when Orestes took his sister to be one of the Furies"), and in others their reasoning was defeetive, but they did not make sueh mistakes. In which, I take it, Asclepiades for the first time attempts a classification based on the presence of illusions, or hallucinations, on the one hand, and of delusions apart from such sensory symptoms on the other. It is further highly significant that he regards hallucinations as of central origin, since in his therapy he notes that in the dark these are often exaggerated, and the patient made worse—to which conclusion it is not impossible that observations on delirium tremens contributed. As to his interpretation of the melancholias of Hippocrates, I can find little record, save in his use of wine to cheer sad hearts.

The therapentic ideas of Asclepiades concerning the insanities are no less original and striking than his ideas of classification.

We learn from Celsus that it was the custom of the ancients to keep the insane in the dark. But Asclepiades alleged that darkness itself strikes terror to the mind, and ordered his hallucinating patients to be kept in the light. Celsus, even a little more advanced, says that neither rule would always hold, and that it was best to try both methods, and to keep him that has a horror of darkness in the light, and him that is afraid of light (meningeal photophobia) in the darkness.

Aselepiades asserted that to make use of medicine in the greatest violence of phrensy was needless, for at the same time the fever increases also, and that nothing is to be done then, except to confine the patient. To bleed such was just the same, in his opinion, as to murder them; upon this prineiple, that there was no madness except when the fever was very high, and that bleeding could not properly be performed unless in its remission.

He endeavored to produce sleep in such cases by much friction. This Celsus, in quoting, disapproves of in cases of fever, and wonders why Asclepiades approved of enemata when he disapproved of blood-letting; for himself Celsus was rather inclined to let blood in certain cases of phrenitis.

Asclepiades disapproved of the Greek custom of obtaining sleep for the delirious by fomenting the face and hands with a sponge dipped in a decoction of henbane, or of poppy juice, for he claimed that they often changed the distemper into lethargy. His advice was that the first day the patient should abstain from meat, drink, and sleep; in the evening water should be given him to drink, then friction should be used, so gently that even the hand that rubbed should not press strongly; the day after, all these things being repeated, in the evening water and gruel should be allowed him; for by this process he would procure sleep. But if by this means sleep was not obtained, then at last it must be procured by the medi-

cines mentioned (that is, the ointment of saffron and iris rubbed on the brow, or a decoction of poppies or henbane), but he cautions moderation in the use of them, lest, as he naïvely remarks, it be not in our power afterwards to wake the person whom we desire to sleep.

The giving of wine was considered by Asclepiades as one of the three chief therapeutic resources—"the use of which makes one approach the power of the Gods." He wrote a special treatise on the use of wine, which has been lost to us. He used it in the various forms of phrenitis to give sleep—in which connection the modern use of chloral, paraldehyde and other alcohol hypnotics may be borne in mind; and he used it to cheer the depressed spirits of the melancholic.

A fall of water near is also a help to some, he suggests, or gestation after meat, and in the night-time, especially, the motion of a suspended bed.

It is easy to see that before the days of Asclepiades, the delirious and insane had been bled and purged to weakness and apathy, and had sometimes been drugged to their last sleep. His very modern opposition to "'potions' that are naturally injurious to the stomach" was favorably commented on even by the caustic Pliny.

We cannot but feel that Asclepiades would have been a kindred spirit had he lived in our day. He must have been a man of common sense, ingenuity and charming personality, for he introduced to a prosperous and self-opinionated nation, that had hitherto believed only in quackery, the very sound principles of hygiene, and raised bathing and massage to a cult. Pliny says that he was responsible for the use of baths at Rome. He was the friend of the rich and the idol of the poor. When he recommended a swinging bed for a patrician, he also showed the poor man how to raise his bed by an uneven support, and be joggled gently to sleep. He lived to be 90 years of age, and won a wager that he would never die a natural death, being killed by a fall.

In closing this note on Asclepiades, I feel that I should quote Friedreich's (10) estimate of him, for in my discussion of Celsus I shall speak further of the therapeutics of Asclepiades that Celsus also approved of and practised. "In Asclepiades we must honor the man who first taught us how to treat the insane, and who in such treatment set forth such ideas that we must feel astonished at, and further ashamed that we have advanced so little beyond him. He was the first to lay the grounds of a psychical treatment. By music, wine, love, occupation, memory exercises, and exercises in attention, he sought to cure his patients. Physical restraint he sought to curtail as much as possible, saying that only the dangerous should be tied."

Asclepiades may justily be called the Father of Psychiatry.

Themison, a disciple of Asclepiades, and a famous physician of Laodicea, who practised in Rome, bridged the space of time between Ascelpiades and Celsus, and was the acknowledged founder of the Methodist School of medicine, which aimed to introduce methods to facilitate the learning and practice of physic. He evidently modified the somewhat strenuous but sound methods of treating the insane that were advocated by Asclepiades. He did away with bathings and acrid purgatives and avoided the use of opium and hyoscyamus as narcotics, for fear of collapse. He reverted to the practice of bleeding, for which Pliny praises him, so much so, that he was known as Themison the Phlebotomist. His strong points in the treatment of such diseases were, the use of wine, massages, and motion; but as none of his writings are preserved, we can only gather his teachings from Celsus.

Celsus has left us less of his personality, and more of his medicine, than any of the other physicians since Hippocrates. Owing to the loss of his predecessor's notes, we cannot say how much of his eight books of medicine are original, and how much quoted. Some have gone so far as to say that, because Celsus also wrote an encyclopedic work on agriculture, and another on military art, he was no physician but merely an encyclopedia writer. His writings, however, show too intimate a knowledge of disease, and too sound a judgment to be those of a compiler. His greatest literary activities were carried on between 35 and 45 A. D.

Celsus' chapter in his third book, entitled "A Treatise on Madness: Of Several Kinds of Madness and their Causes," is an epitome of the treatment of the insane handed down to his own times, that is, to the beginning of the Christian era.

Of Celsus I can find little gossip of birthplace, or personal attributes. The name alone, A. Cornelius Celsus, has come down to us on the title page of his works, and they must speak for him.

Celsus follows Asclepiades in the general divisions of insanity, as his phrenitis is also applied to delirium, and contrasted with true phrenitis, which is a real insanity. He says: "I will begin with insanity, taking up first that form which is acute and which appears in fevers. The Greeks call it phrensy. It behooves us to know that the sick may become delirious, and say strange things in the attacks. This is a serious symptom, and is not apt to happen, unless in the case of a violent fever. It is, however, not necessarily destructive, for it usually is of short duration, and as soon as the attack is relieved, the reason returns. Such an attack requires no remedies other than those which have been prescribed for fever" (11).

"Then comes phrenitis, the state in which the madness is continued, or when the sick person, although he may be in his senses, nevertheless has certain chimerical ideas. It is perfect phrensy when the mind is addicted to these images. Among those with phrensy are some who are merry, others sad, some are easily restrained, and confine their ravings to words, others rise up and do violent things. In this class some employ force, and others make use of cunning."

"Such of them as only rattle on, or do no harm, but in trifles, need not be subjected to severe restraint. Those who are more violent in their actions, it is proper to bind, lest they hurt themselves and others. Nor should we trust any of them if, in order to get rid of his chains, he pretends to be well, though he speaks sensibly, and makes lamentable complaints, because this is nothing but the cunning of a mad person."

In the deliria which we now know to be infectious, and alcoholic deliria, Celsus discusses the advisability of enemata and advises shaving the head, and fomenting it with a decoction of astringent herbs, and of producing sneezing by holding rue, bruised in vinegar, to the nostrils.

I find little in the therapy of Celsus that has not already been found in Hippocrates and Asclepiades, but quote his own words, in some of which he gives praise to Asclepiades, in others not mentioning him. The following remedies, which sound modernly psychic in their nature, he says must be made suitable to the temper of each: "The groundless apprehensions of some are to be alleviated, as was done to a very rich man in fear of starving, whom they relieved by frequent accounts of estates bequeathed to him. The audaciousness of others must be restrained even by stripes if necessary. The unreasonable laughter must be checked by chiding and threats. The sorrowful thoughts of other must be dispelled, for which purpose concerts of music and cymbals and noise are useful. Yet these patients must oftener be humored than contradicted, and the mind is to be led by slow degrees, and not with evident intention." From this it may be seen that psycho-therapeutic conversations were a part of the physician's art in the Augustan era.

"Sometimes also the attention of a person must be strongly engaged." He suggests "reading a book to a scholar, with an improper accent, so that he may be aroused to correct it," and reports that he has brought patients who were fasting to eat, "by placing them in the midst of people who were at a feast" (12).

"For another kind of madness which continues a longer time, and goes no farther than a sadness, bleeding is useful, also purging by white hellebore, and vomiting, friction and exercise." This evidently was melancholia, which, according to the Hippocratic doctrine, was caused by black bile, from which we see that Celsus slumps from his allegiance to his predecessor. The psychic treatment here consists of raising the patient's hopes by amusing stories and discussions. "If there are any works of his performing, let them be placed before the patient's eyes."

"The third kind of insanity is the longest of all, insomuch that it does not shorten life. There are two species of this. In some the deception arises from false images, not from the understanding; such a madness the fables of the poets represent in that of Ajax or Orestes. Others are disordered in their judgment."

"If imaginations mislead, first of all it must be observed whether they be melancholy or merry. If melancholy, black hellebore ought to be given as a purge. In the merry kind, the white as an emetic. . . . .

"But if the madness affect the judgment, the patient ought to be treated by some kind of tortures. When he has said or done anything wrong, he is to be punished by hunger, chains, stripes, ... For thus it will happen that gradually by fear he may be obliged to consider what he does. It is also serviceable in this disorder to be put in sudden consternation and fear." This treatment he considers better for a merry madman, while for the extremely sad, he advises long friction twice a day, and pouring cold water on the head.

In summing up this brief treatise, which represents the most extensive work of any of the ancients upon madness, Celsus lays down the following rules: That "Mad people ought to be strongly exercised, to have much friction or massage, to take neither fat, flesh nor wine, to eat lightly after purging; that they should neither be alone nor among strangers, nor among those whom they despise or look upon with indifference; that they ought to travel in other countries, and, if their judgment returns, to take a journey into distant parts once a year."

It is a sorry comment on the latter days that all that was bad in Celsus' system, the chains, the beatings and the darkness, were faithfully copied for centuries; while all that was good in the therapy of Asclepiades, the music, the sports, the cheerful thoughts, as well as the massage and regular exercise and change of air, was overlooked and almost lost.

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V. THOMAS MUFFET, 1553-1604.

By John Ruhrah, M. D., Baltimore.

One of the most interesting, though all but forgotten physicians of Shakespeare's time, was Thomas Muffet. Like the immortal bard he was careless about the spelling of his name and we find it written three different ways, Moufet, Moffett and Mutfet.

Muffet was a London lad, born in all probability in the parish of St. Leonard, Shoreditch, and was of Scotch descent, being the second son of Thomas Muffet, citizen and haberdasher of London, and Alice Ashley, of Kent. He is said to have spent five years in the Merchant Taylor's School, and

then, in 1569, at the age of 16 he was matriculated as a pensioner of Trinity College, Cambridge. In 1572, he changed to Caius College, where he was graduated as a bachelor of arts; during this period he also studied medicine under Thomas Larkin and John Caius, the latter he mentions in his Health Improvement. Amongst his friends and fellow students were Peter Turner, Timothy Bright and Thomas Penny, all of whom became distinguished as physicians.

During his undergraduate course he was poisoned by eating mussels and he refers to shellfish, and chronicles the event in Health Improvement, as follows:

Only Oisters of all fish are good raw (yet he was no Coward that first ventured on them).

For Diogenes died eating raw fish and Woolmer (our English Pandereus) digesting iron, glass and oister shells, by eating a raw eel was overmastered.

Mussels were in credit, but amongst the poorer sort; till lately the lily-white *mussel* was found out about Romers-Wall, as we sail between *Flushing* and Bergen-up-zon, where indeed in the heat of Summer, they are commonly and much eaten without any offence to the head, liver or stomach; yea, myself (whom once twenty mussels had almost poisoned at *Cambridge*, and who have seen sharp, filthy and cruel diseases follow the eating of English mussels) did fill myself with those mussels of the Low Country, being never a whit distempered with my *bold* adventure."

In 1576 he was expelled from Caius College because he chose to proceed as master of arts from Trinity and later he went abroad to study and received his degree of doctor of medicine at Basle, in 1578, and whilst there he was a student of Felix Plater and Zwinger. During the following year, 1579, he traveled in Italy and Spain and studied the silk industry which he afterwards described in a poem to be noticed later. In 1580 he was at Nuremberg and Frankfort. During his entire life he seems to have been devoted to travel and besides the countries mentioned he visited Denmark, High Germany, Holland, Bohemia, Switzerland and Wales.

On his return to England he was incorporated doctor of medicine at Cambridge and in the same year, 1582, he visited Elsinore, Denmark, in company with Peregrine Bertie, Lord Willoughby, who carried the ensign of the Order of the Garter to the king. He mentions that the State banquets last from seven to eight hours. Muffet met and knew a great many distinguished people, among them Tycho Brahe and Peter Severinus. To the latter he dedicated his first essay on medicine.

In 1588, he resided at Ipswich where he is said to have had a good practice and later on he lived in London. In 1588 he was made a fellow of the Royal College of Physicians and one of the censors the same year.

He attended a number of notable personages, among them Sir Francis Drake, who first showed him the flying fish. He quotes what was evidently a well-known pun concerning him: "What *Lawyer* has not heard of *Mr. Tonsiels* conceit, who is feared as much with a dead duck as Philip of Spain was with a living *Drake?*" Another personage whom Muffet studied was Woolmer, "the foul-mouthed breeder."

In 1591 he is said to have been with the Earl of Essex, in camp in Normandy. He was much patronized by the Pembroke family and the latter part of his life he spent as a retainer in that family from whom he received a pension chiefly through the favor of Mary, Countess of Pembroke, to whom he dedicated his poem on the silk worm. During this time he resided at Bulbridge, near Wilton. Through the influence of the Earl of Pembroke he was elected a member of Parliament from Wilton, in 1597. He was twice married. First to Jane Wheeler in 1580. She died in 1600 and he took for his second wife a widow, Catherine Brown, who survived him. He died in 1604.

Muffet was one of the earliest of the Paracelsians or chemical sect in England and with John Herter, was one of its chief exponents. He was one of the first to introduce the use of chemical medicines into England and his first publication was a defense of the chemical sect. John Aiken in his Biographical Memoirs of Medicine (London, 1780) gives the following account of this work, the title of which is De jure et præstantia Chemicorum Medicamentorum, Dialogus Apologeticus. Francof. 1584.

This is an acute well-written apology for the chemical sect in medicine, which then began to prevail greatly in Germany and other countries, but met with violent opposition. The dialogue is a kind of disputation between a Chemist and a Galenist; the latter of whom, however is very willing to be convinced. The Chemist enumerates many eminent men who favored his sect; among whom are Montanus, Fernelius, Villanovas, Fracastorius, Cardan, Gesner, Platerus and Severinus. He enters into an explanation of the Paracelsian doctrine of the double life in animals, one, which acts in themselves, the other, which acts upon other bodies; which doctrine seems only to be an extension of the word life, to signify everything that is capable of agency. He then defends the chemical practice of extracting by means of menstrua or the action of fire the active parts of vegetable simples; and falls into keen raillery of the Galenical compounds, and the loads of nauseous drugs exhibited by that sect of physicians. To these he proposes the substitution of tinctures and essential oils. He next considers the mineral class of medicines, and defends their use against the objection of the Galenist, proving that both ancients and moderns of their own school employed such of them as they were acquainted with.

Aiken also says that the work exhibits a good deal of learning and skill in argumentation.

To this piece, in the Theatrum Chemicum, 1602, are subjoined Epistolæ quinque Medicinales, ab eodem Auctore conscriptæ. They are all dated from London in the years 1582, '83 and '84. The first of these contains a defence of Paracelsus, intermixed with some keen reflexions on Hippocrates, Galen, and their followers. The second exposes some of the fanciful reasonings of Galen, and maintains the propriety of reasoning from the evidences of our senses, rather than from imaginary hypotheses. The third contains some very sensible and liberal remarks against absolute submission to the authority of great names or leaders of a sect. Here also, are introduced some further attacks on ancient medical doctrines. The fourth gives the application of the chemical principles, salt, sulphur and mercury, to the phenomena of the human body and the theory of diseases; and is a most striking proof how blind a person may be to nonsense and absurdities of his own sect, while he is sharp sighted enough in detecting them in others. The last epistle treats of the benefits of foreign travel to a physician, and contains some exhortations to the study of chemistry. Padua is the medical school particularly recommended by this writer. Another work is entitled Nosomantia

Hippocratica, sive Hippocratis Prognostica cuncta, ex omnibus ipsius scriptis methodice digesta. (Lib. IX. Francof. 1588.)

Aiken comments further upon these pieces which, however, he had never seen.

Still another work is Insectorum sive minimorum Animalium Theatrium; olim ad Edw. Wottono, Conrado Gesnere, Thomaque Pennio inchoatum. This he left in manuscript and it was published at London in 1634 by Sir Theod. Mayerne, into whose hands it came by means of one Darnel, who had been Muffet's apothecary. Some imperfect copies of it, however, had been printed by Laur. Scholzius in 1598. It was translated into English, and published in 1658. Sir Theod. Mayerne complains much in an epistle prefixed to this work, of the great difficulty he found in getting a printer to undertake it; several in various countries having refused his offer.

Muffet's most important contribution to literature is entitled:

Health Improvement
or
Rules
Comprizing and Discovering
The Nature, Method, and Manner of
Preparing all sorts of
Food
Used in this Nation.

Written by that ever Famous
Doctor in Physick

Thomas Muffet.

Corrected and Enlarged
by
Christopher Bennet,
Doctor in Physick and Fellow of the
Colledg of Physitians in London.

London.
Printed by Thos. Newcourt for Samuel Thomson, at the
Sign of the white Horse in
Pauls Churchyard, 1655.

Besides this first edition by Bennet which is now a very rare volume, there is another edition of it "with a short view of the author's life and writings by Mr. Oldys, and an introduction by R. James, M. D., published in London, 1746."

Aiken says of this book that:

It is a curious and interesting book as well on account of the numerous anecdotes and observations quoted from the antients, as the information contained in it respecting the diet in this country at the time he wrote it. Still his credulity and want of just principles to bare a discrimination of different kinds of food and his credulity with respect to facts related by old writers, render his reasonings of little value.

One of the charms of the book is the glimpse it gives us of the diet in Muffet's time and especially of the dear old doctor himself. It is a book to keep on your desk and read a little in from time to time. By so doing one adds a new friend in an honest, educated gentleman of a most genial disposition.

From the excerpts which follow one can readily get a good idea of the character of the book. The status of dietetics in his day seems to have been much as it is now, as he says:

So now in our daies the name Diet seems but a scarecrow to the unwiser sort, who think it best diet, keeping no diet at all saying (as Will Somers said to John Rainsford) drink wine and have the gout, drink no wine and have it too.

Muffet was interested in the question of the value of odors in medical treatment and thought that they had considerable value as he states: "The very smell of physick cures many." He considered the following observation of great value in establishing the effect of odors as preventatives against infectious diseases:

But here a great question ariseth, whether sweet smels correct pestelent aire, or rather be as a guide to bring it sooner to our hearts? To determine this question I call all the dwellers in *Bucklers* berry in London to give sentence: which only street (by reason that it is wholly replenished with Physick, Drugs and Spices, and was daily perfumed in the time of the plague with pounding spices, melting gums, and making perfumes for others) escaped that great plague brought from Newhaven whereof there died so many, that scarce a house was left unvisited.

It is interesting to note in this connection that the idea of keeping off infections by odorous drugs is still very prevalent, asafedita being thought to be one of the most efficacious preventatives.

On the choice of foods and the abnormal articles of diet the author gives a great number of interesting, albeit untrustworthy, accounts. He classifies meats and other foods into four degrees according to their heat and moisture. Meats hot further than the second degree, he says, are reckoned by physicians to be rather medicine than meat. The following stories need no comment:

Yea, myself have known a young Maide, of an exceeding moist and cold complexion, whose meat for two years was chiefly pepper, wherewith another would have been consumed though she was nourished for it is hot in the third degrees and moist in the fourth degree.

Mecænas coveted the meat of asses foals, whereby the whole race of asses, had been extinguished, but he died in good hour.

The Russian was held in no high esteem by Muffet, witness the following:

The Sudanes desire to feed on lice, which a Muscovite abhors so to kill; lest unnaturally or unwittingly he slay his own blood.

It were strange to believe (yet Fernelius writes it for a truth) how a nobleman of *France* found a great sweetness in quicklime, then in any meat beside, refreshing his stomach and hurting no inward part with the continued use thereof. Others feed greedily on rags of woolen cloth and wall-morter: And *Anatus Lusitanus* remembereth a certain young maid of twelve years of age, who did usually eat stones, earth, sand, wooll, cotton and flox; esteeming their taste and substance better than the finest and tenderest partridges. *Marcellus Donatus* saw a girle so longing after

Lizards and Neayts, that she would hunt after the one in the Gardens, and after the other in houses with a bough in her hand as a cat would a mouse, and eat them without hurt.

Albertus Magnus (as Cælius reporteth) saw another wench in *Collen*, but three years old hunting as delightedly after all sorts of spiders, with which meat she was not only much delighted but also exceedingly nourished. Yea Doctor Oethæus telleth a story of a certain farmer in the country of Hirsberg, that feedeth chiefly on potsherds finely beaten batling no less with them than Marriners do with eating bisuit. And *Joachim Comerarius* (my dear and learned friend) reporteth a certain girl in *Norimberg* did eat up her own hair, and as much as elsewhere she could get; neither could she be persuaded by her parents or friends, to think it an unpleasant or an unwholesom meat.

Concerning the number of dishes at one meal and the quantities of food consumed Muffet gives among other examples the following:

But what followed? Over eating. Marry infinite diseases and infinit Physitians; whereof some were so ignorant that they tormented the people worse than sickness; in such sort that Galen, Herophilus, Erisistratus and divers great Physitians were sent for to recover them languishing and consumed almost with fevers, whereinto through excess and variety of meats they were justly fallen.

Of the quantity of meats:

Of this crue was Maximus the Emperor (like our old Abbey Lubbers) ate till he sweat; yea Sabellicus affirmeth that his one days sweat gathered up in goblets, did amount to the measure of six sectaries.

And though Aurelianus the Emperor fed moderately himself, yet he exceedingly loved and honored a great Gourmand, who usually at a meal did eat a Hogg, two weathers, and a whole brawn, drinking upon it a whole firkin of wine poured down his throat through a funnel.

Clodinus Albinus (commander of the Romans in France) is registered to have eaten at one sitting 500 figs, 100 peaches, 10 musk melons, 20 pound weight of Raysins of the Sun, 100 snites, 10 capons and 150 great oysters.

Of the length of time spent at meals Muffet gives a personal experience:

Switrigalus, Duke of Lithuanua, never sat fewer than six hours at dinner, and as many at supper: from whom I think the custom of long sitting was derived to Denmark; for there I remember I sat with Frederick, King of Denmark, seven or eight hours together at one meal. But of all long sitters at table, farewel Hugutio Fagiolanus who (as Petrarch reporteth) lost both the city of Pisa and Lukes at one Dinner, because he would not arise (although a true alarm was given) to repel the enemy till his dinner was fully ended, which was usually protracted two or three hours.

Muffet understood the dangers of overfeeding and sustained his opinion with the following classical allusion:

Hippocrates and Galen say, that the bodys of ordinary great feeders stand upon a dangerous point or as you would say upon a razor edge.

Muffet curiously enough says of milk:

There are few diseases to which milk is not offensive being inwardly taken, except the consumption of the solid parts called *marasmus*, atrophia, and the consumption of the lungs and breathing parts called Phthisis.

One of the most interesting parts of the whole book are his observations on milk and his words of advice on the "Chusing of a Good Nurse" are unsurpassed:

The nurse must be young, clean of skin, of a kindly smell, pure complexion, good temperature, wholesom and moderate diet, much sleep and little anger, neither too idle nor too toiling, no wine bibber, no eater of hot spices, no ordinary wanton, and void of all diseases; such a nurse is sooner wished for than found, yet such a one is to be chosen for sound children or sick Persons, lest drawing corruption in so fine a meat as milk is, our consumptions be increased so much the more, by how much poison given with drink is more dangerous.

Furthermore care is to be taken of their health, that give us milk; for as an unclean and pocky nurse (which woful experience dayly proveth) infecteth most sound and healthy children, so likewise a clean, sound and healthy nurse recovereth a sickly and impotent child. Nay (which is more) no man can justly doubt, that a child's mind is answerable to his nurses milk and manners; for what made Jupiter and Aegystus so lecherous, but that they were chiefly fed with goats milk? What made Romulus and Polyphemus so cruel but that they were nursed by shewolves? What made Pelias (Tyrus and Neptunes son) so brutish but that he was nursed by an unhappy mare? Is it any marvel also, that Giles, the Abbot (as the Saint-Register writeth) continued so long the love of a solitary life in woods and deserts, when three years together he suckt a doe? What made Dr. Cajus in his last sickness so peevish and so full of frets at Cambridge, when he suckt one woman (Whom I spare the name) froward of conditions and of bad diet; and contrariwise so quiet and well when he suckt another of a contrary disposition.

Muffet was much interested in the physiological and the pathological effects of foods. He voiced an opinion, just now extolled, namely, that "Eggs recovereth men from consumption."

He seems to have been particularly interested in the question of the effect of food upon the generative organs. Concerning the sea mullet he writes in this connection:

It is strange what is written of this fish namely that it should hurt Venus game; yea that the very broth of it, or the wine wherein it is sodden should make a man unable to get and a woman unable to conceive children.

Concerning salt he makes the following curious note:

For of all things it is very effectual to stir up Venus. (Salaciousness.) An Experience teacheth that mice in vessels lying in Hoyes laden from *Rochel* with salt, breed thrice faster than if they were laden with other merchandise. A woman eating much salt when she is with child bringeth forth a child without nails.

He also mentions many foods which are advised to be eaten to relieve impotence. His morals are, however, always too good to permit him to set down the full details. He states:

Many are of the opinion that Cawdles made strong with the pith (marrow) of a steer and yelks of new laid eggs do by a secret property restore nature, and recover the weakness of the loyns caused by venery. Montagna maketh a singular confection of divers marrows to this purpose, which I will not set down in English, lest Wantons be bold to follow their follies.

It is recorded by St. Jerome in his epistles, that *Seneca* upon a foolish conceit abstained as long from flesh, and fed only upon fruit and fish (infected perhaps with the leaven of the Egyptian priests) that when upon Nerœs commandment he was bled to death there did not spring from him a drop of blood. The like is written of Genoveve the holy maid of Paris.

The contrary whereof is proved by the Islanders, Greenlanders, who living upon nothing but fish are nevertheless exceedingly lecherous and their women exceedingly fruitfull. Yea Venus the mother of lust and lechery is said to have sprung from the fome of some fish, and to have been borne in the sea, because nothing is more available to engender lust than eating certain fishes and plants, which I had rather in this lascivious age to conceal from posterity than to specify them unto my countrymen, as the Grecians and the Arabians have done to theirs.

Of the effect of a vegetarian diet he tells the following anecdote:

Thus much said *Baldwin* Archbishop of *Canterbury*, of whom Rainulphus writeth this story. When Baldwin was chosen Archbishop of *Canterbury* he sware that from the time of his installment to his dying day, he would never eat flesh: whereby his body so decayed that he fell into a consumption: an old woman meeting him on the way as he was carried on a open Horse-litter, called him liar to his face; whereof being reproved by some of his followers, why (said she) do you rebuke us? doth he not lie, for saying that he never ate flesh since his installment, when his own face sheweth that he surpassed the savages in eating his own flesh? for indeed by the superstitious observance of his vow he had become an anatomie and lived as a cypher among men.

Muffet knew, too, that epilepsy and diet were closely connected, but he was inclined to regard articles of food as the specific cause.

Quails have gotten an ill name ever since *Pliny*, accused them for eating Hemlocks and Bearfoot; by reason whereof they breed cramps, trembling of the heart and sinews; yea though Hercules loved them above all other meats, insomuch that Iolaus fetcht him out of a swoon when he was cruelly wounded by Typhon, with the smell of a quail; yet with much eating of them he fell into the falling evil, which ever since hath been termed Hercules' sickness. And here let us marvel at one thing, that Quails are generally forbidden because their flesh engendereth the falling evil, and yet Galen commandeth their brains (the principal seat of that great evil) as antidote against the same.

There are many curious notes on the diseases caused by various foods and also regarding the curative effects of them. Among the most valuable of these medicinal foods was the flesh of the hedge-hog.

As some affirm it nourisheth plentifully, procureth appetite and sleep, strengtheneth Travailers, preserveth woman with child from miscarrying, dissolveth knots and kernelly tumors, helps the Lepry, Consumption, Palsy, Dropsy, Stone, and Convulsion; onely it is forbidden unto Melancholick and Flegmatick persons and such as are vexed with Piles and Hemorrhoids.

The roebuck, cureth also, (as Isaac writeth) the falling sickness, colick, and an abundance of fleam collected in any part.

Galen saith the flesh of a hare prevents fatness, causeth sleep, cleanseth the blood; howbeit in another place he saith that it breedeth gross blood and melancholick humors; which unless he understood only of old and unseasonable Hares, experience itself will overthrow him. Certain it is that much eating of Hares flesh procureth leanness because it is very diuretical, and common sense teacheth that a man pissing much can not be fat, because the wheyish part of the blood is sooner expelled than it can carry nourishment throughout the body.

In the preceding quotation, as in one given earlier, one notes the evident attempt to show up Galen in a very palpable error. Muffet it will be remembered, was an opponent of the Galenical school.

Of eels he says:

They give much nourishment but very corruptible: they loosen the belly and bring fluxes, they open the wide pipes, but stop the liver; they clear the voice but infect the lungs; they increase the feed but no good feed: finally they bring agues, hurt the stomach and kidneys, engender gravel, cause strangury, sharpen the gout, and fill us full of many diseases: they are worst in the summer but never wholsom. Sith like the owle it never comes abroad to feed but in the night time it argueth a melancholy disposition in itself, and a likelihood to beget it in us.

Concerning human flesh as a food he writes:

The Canibals praise it above all others (as Osorius writeth) and Cambletes, King of Lydia having eaten his own wife, said he was sorry to have been ignorant so long of so good a dish.

Of the use and the preparation of food Muffet gives many rules. I shall make but one quotation:

Another thing also to be observed before the killing of any beast or bird; namely, how to make it tendered if it be too old, and how to make it of best rellish: Patrocles affirmeth that a Lion being showed to a strong Bull three or four hours before it is killed, causeth his flesh to be as tender as the flesh of a Steer, fear dissolving his hardest parts and making his heart soft and pulpy.

He warns against strawberries, saying:

Howsoever they are prepared, let every man take heed of *Melchior Duke* of Brunswick how he eateth too much of them, who is recorded to have burst asunder at Rostock with surfeiting upon them.

These quotations could be multiplied but would probably not give one any better understanding of the nature of the little book on Health Improvement.

A very interesting poem by Muffet has the following title page:

The
Silkewormes, and
their Flies:
Lively described in verse, by T. M.
a Countie Farmar, and an apprentice in Physicke.
For the great benefit and enriching of England
Printed at London by V. S. for Nicholas Ling, and
to be sold at his shop at the West ende of
Paules. 1599.

In 1866, Halliwell in his Collection Shakesperiana, gave the following account of this work: "This rare book has never been brought into connection with Shakespeare, yet it has for a long time appeared to me to be of singular interest as a popular book at about the time when we may suppose that Shakespeare planted the mulberry tree in the garden at New Place. Chamberlain wrote to Carlton, in 1598: 'The Silkwormes is thought to be Dr. Muffet's, and is in mine opinion no bad piece of poetrie.' It is dedicated 'to the most renowned Patronesse and Noble Muse of Learning, Marie Countesse of Pembroke.' The author's account of *Pyramis* and *Thisbe* apparently bears traces of a reading of *Midsummer Night's Dream.*"

The dedication is in verse three stanzas long. The poem itself begins with a reference to the time when man was guileless and needed no clothes but sin having entered the world, a sense of shame was felt and a desire to cover the body. Many are the classical allusions which the author makes. He recounts how some refer the use of flax to the time of Orpheus, who by the power of his music drew men "Wood wandering wights, to good and civil life."

From Hironimus Vidas, Bishop of Alba, he borrows the story of Venus, seeing Pallas and the other nymphs and goddesses taught by Saturn how to clothe themselves in lawn and cambric:

> fretted to see herself and boy new borne,
> Left both to heaven and earth an open scorn.

She cried to Jove, offering to teach him the art of love, but he refused her aid. In order to brew trouble Venus chose Phyllira, the daughter of Oceanus, and:

> Straight lodged her son in fair Phillyræs eyes
> And caused him thence to dart up such a fire,
> As had consumed the very starres and skies
> Yea melted Saturns wheels with hot desire.

Saturn responded promptly and sought to woo the maid, but:

> He loved, she loathed, he liked, she disdained,
> He came, she turned, he pressed, she ranne away.

Saturn then sought out Venus and offered her the richest clothing for the secret of her art, and to requite her:

> He sent a Napkin ful of little seeds,
> Tane from the tree where *Thisbes* soul did light,
> To make herself and boy farre braver weeds,
> Than *Pallas* had, or any of the sev'n,
> Yea, then proud Juno ware the Queen of Heaven.

With this gift of the mulberry tree he sent along the art of weaving.

Muffet also tells briefly the story from Pliny of how Paniphila, the most princely daughter of Latous, while hunting in the Cean Ile, sat under a tree and found "many silken bottoms," the use of which she quickly discerned. The larger part of the poem, however, deals with the story of Pyramis and Thisbe, whose souls some authors say are the silk worm moths. Muffet touches on but does not settle the vexed question of whether the egg or the moth was first and gives the learned opinions of several old writers upon this subject.

The first part of the poem ends with the following Kiplingesque appeal to the English people:

> Dull witted dolts that huge things wonder at,
> And to your cost coast daily from your ile
> To see a Norway whale, or Libian Cat,
> A carry-castle or a crocodile,
> If lean Ephesian, or the Abderian fat
> Lived now, and saw your madness for a while,
> What streaming flouds would gush out from their cries,
> To see great Wittols little things despise.

The second part of the poem deals with the silk worm and its care. The mulberry tree on which these worms feed is thus described:

> I leave to tell how she doth poison cure
> From adders goare or gall or lizards got,
> What burning blaines she heales and sores impure,
> In palat, jawes, and al enflamed throte,
> What canckers, hard, and wolfs be at her lure,
> What Gangrenes stop that make our toes to rotte:
> Briefly, few greifes from Panders boxe out-flew,
> But here they finde a medicine, old or new.

Muffet noted the infectiousness of the silk worm disease and directs the separation of the dead and sick:

> Wisdom commands to part the dead and sick
> Lest they infect the faultless and the quick.

He compares their sleep to the Epidemic sweat:

> Oft shalt thou see them careless of their meate
> Yea overtane with deepe and heavie sleepe,
> Like to the strange and Epidemian Sweate,
> When deadly slumbers did on Briton creep.

Silk, according to Muffet, was a useful medicine and antidote as the following lines tell:

> From out all three, but chiefly from the best,
> Are made not onely robes for priests and kings,
> But also many cordial medicines blest,
> Curing the wounds that sullen Saturn brings,
> Which being drunk, how quiet is our rest?
> How leaps our hart? how inwardly it springs?
> Speake you sad spirits that did lately feele
> The heart-brake crush of melancholies wheel.

The recipe for the Confectio Alkermes, "which is a most singular Electuary against Melancholie, if it be rightly made," is to be compounded as follows:

> Nay, Nay, no silke must make the antidote
> Save only that from spinsters veins is got
> Whereof if thou a pound in weight shalt take
> Unstained at all (as Amiens Floure doth write)
> And with the juce of rose and pippins make
> A strong infusion of some day and night,
> Adding some graines of musk and Ambres flake,
> And seething all to honey substance right:
> O what a balm is made to cheere the heart,
> If pearle, and gold and spices beare a part?

The flower of Amiens mentioned above refers to Fernelius, from whose works the recipe is evidently taken.

The closing stanzas of the poem are devoted to extolling the joys and pleasures of raising silk worms, and very thorough directions are given concerning their care and the manufacture and uses of silk.

Muffet represents a type of physician which has for centuries been the ideal of the British practitioner. A scholarly and gentlemanly physician, with a love of literature, of scientific research and particularly of natural history. A man taking a part in the life of the world as well as active in his profession. A man with altruistic ideals who wished to help his fellow countrymen. A man popular at home and abroad who left a little legacy to the literature of his profession which every now and then some one takes delight in bringing before the reading public.

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CONTENTS.

PAGE

The Volume Curve of the Ventricles in Experimental Mitral Stenosis, and its Relation to Physical Signs. (Illustrated.)
By Arthur D. Hirschfelder, M. D. 319

Contributions to the Study of Auricular Fibrillation, Paroxysmal Tachycardia, and the so-called Auriculo-(Atrio-)Ventricular Extrasystoles. (Illustrated.)
By Arthur D. Hirschfelder, M. D. 322

Placental Syphilis; A Study of Syphilitic Placentæ with Regard to the Presence of the Spirochæta Pallida. (Illustrated.)
By W. O. Pauli, M. D. 326

A Method for Complete Enucleation of the Tonsil. (Illustrated.)
By John A. West, M. D. 328

PAGE

A Simplification of De Grandmont's Operation for Ptosis.
By Samuel Theobald, M. D. 331

Three Cases Illustrating the Relationship Between Certain Diseases of the Blood and Sarcoma.
By F. G. Bushnell, M. D., D. P. H. 332

The Teaching of Physiological Pathology at the University of Michigan.
By F. Peyton Rous, M. D. 336

The Tonsillar Ring and the Paranasal Sinuses as Portals of Entry of Infectious Diseases.
By Sylvan Rosenheim, M. D. 338

Notes on New Books 344

THE VOLUME CURVE OF THE VENTRICLES IN EXPERIMENTAL MITRAL STENOSIS, AND ITS RELATION TO PHYSICAL SIGNS.

By Arthur D. Hirschfelder, M. D.,

Associate in Medicine, Johns Hopkins University.

(*From the Medical Clinic of the Johns Hopkins Hospital and University.*)

Method of Experimentation.—The volume curve of the ventricles was obtained by means of Tigerstedt's cardiometers as modified by Yandell Henderson (1), varied only by inverting the recording tambour, as shown in Fig. 1. The carotid pulse curve was recorded simultaneously by means of a Huerthle membrane manometer.

The mitral stenosis was produced by introducing a large curved needle bearing a stout silk ligature backwards through the anterior wall of the left ventricle at a point near the septum and just below the atrio-ventricular groove. This was brought out at a corresponding point on the posterior wall of the ventricle, and then the two ends of the ligature were carried around the atrio-ventricular groove to the outside of the ventricle, so that when they were pulled taut the anterior flap of the mitral valve was pulled laterally, and the orifice thus narrowed. The degree of narrowing could thus be varied at will (Fig. 2).

No curves showing the changes in the volume of the ventricles have been published previously.

In the volume curve of the normal dog's heart, at its usual rate, the upstroke corresponds to the forcing out of the blood into the aorta during systole. This is followed by the beginning of diastole, with the immediate filling of the ventricles (downstroke on curve). The blood enters from the auricles under the force of the venous pressure. The auricles remain passive. In this way about four-fifths of the ventricular filling takes place, the rapidity of filling being represented by the steepness in the descent of the curve. When the rate is as rapid as is usual for the dog's heart, this period of passive filling lasts until the next contraction of the auricle, which drives a small amount of blood (about one-fifth of the total amount) into the ventricle at a rate a little more rapid (curve a little steeper) than the passive filling. The amount which the auricles contribute to the filling of the ventricles, or the systolic output of the auricles never exceeds about one-fourth the systolic output of the ventricles in the normal heart, and frequently falls to one-tenth or less. If the heart rate is slower, that is if diastole is longer, a point is reached at which

the filling of the ventricles comes to a standstill before the auricular contraction sets in. This cessation is due to the fact that an equilibrium is reached between the pressure in veins and auricles tending to drive the blood into the ventricles and the tonus of the ventricular muscle tending to resist further distension. From this point to the time of auricular contraction, the amount of blood entering the ventricles is extremely small, and the volume curve becomes nearly horizontal. Henderson terms this the period of *diastasis*. The transition from diastole proper to diastasis is marked by a more or less definite shoulder upon the volume curve. Henderson states that at this moment the auriculo-ventricular valves close rather suddenly, a phenomenon which can be demonstrated upon a properly constructed model. It can be still more readily demonstrated upon an excised heart from which the upper wall of the auricles is cut away. If water is now poured through the auriculo-ventricular valves from a beaker, it will be noted that the moment the inflow ceases the cusps of the valves flap together, and that the auricular floor formed by them is almost level. The cusps are approximated along the line of closure; and if the height from which the water has been poured exceeds a couple of inches, *the valve is seen to be tightly closed.* The inertia of this closure is quite considerable, requiring a pressure of several centimeters of water to overcome it. The closure is evidently due to the fact that in order that the ventricles may fill to their greatest capacity their cavities must tend to approach the hemispheric form, and the spaces between valve and ventricular wall must be filled as much as possible. This creates a force which tends to float the valves outward, and which, at the moment when inflow ceases, is supplemented by the elasticity of the ventricular walls. It has been suggested that, with the valves even in a normal condition, this closure is sudden enough to produce the third sound of protodiastolic gallop rhythm or the so-called third heart sound (Hirschfelder (2), A. G. Gibson (3), Thayer (4)).

The reason for the change from rapid inflow to stasis is apparently the fact that during the former period the inflow is accelerated by the elastic dilatation of the ventricle and the negative pressure within it, as well as by the large difference between this pressure and the pressure then present in the auricles (from stasis during ventricular systole); whereas after cessation of the rapid inflow and closure of the valves the pressure in the auricles and ventricles is almost exactly equal, and the only force tending to drive blood into the ventricles is that of the blood which accumulates gradually before auricular systole. Since it requires a certain pressure to overcome the inertia of the valves, a period of absolute diastasis without further filling may intervene. If the pressure in the auricles rises more rapidly, or the tonus of the ventricular muscle is low, the filling may proceed further but at a slow rate during the period of diastasis. The further filling of the ventricle from the auricle is the same as when the heart rate is rapid.

In the first stage the volume and systolic output of the ventricles is diminished (volume curve transposed to a higher level), due largely to the fact that the filling of the ventricles is slowed (downstroke upon the curve less steep than normal). The amount of ventricular filling due to the auricles is increased, owing to the accumulation of blood in these chambers at the time they contract, as well as to the fact that the left ventricle is not yet fully distended.

In the second stage the filling of the ventricle proceeds for only a small fraction of the usual period. This is followed by a period during which no further filling occurs until the contraction of the left auricle, which now forces an unusually large amount of blood into the ventricle. This stage corresponds to the condition in which the presystolic murmur is loudest, a fact which is readily demonstrable experimentally.

In the third stage the cardiac volume is much diminished, due mainly to the further diminution in filling, and to the stagnation within the auricle which has led to auricular paralysis. The volume curve is now represented by a short period of systolic output and a short period of ventricular filling, followed by a period during which no further change of volume occurs and no evidence of auricular systole can be seen. The auricle is now paralyzed. This is noted both in animals and in man by the disappearance of the presystolic murmur, and by the appearance in many cases of an "absolute irregularity" in force and rhythm which probably has its origin in the left auricle. This is the so-called "mitralized pulse" (Fig. 5).

The question naturally arises, what relation do these changes in volume bear to the abnormal sounds heard in mitral stenosis, and what light do they throw upon the disturbance of function? The sounds are due to two elements, the muscular contraction and the vibration of the valves. They may also be said to be brought about *actively* during a period of cardiac contraction, or *passively*—during a period of relaxation, the presystolic murmur being quite evidently due to the contraction of the auricle and disappearing when auricular paralysis sets in. Since no other contractions appear between the end of ventricular and the beginning of auricular systole, it is evident that the events occurring within this period are probably of valvular origin.

Study of the volume curve during this period, especially in the second or moderate stage of stenosis, reveals the well-marked elbow which occurs at the end of the period of rapid ventricular filling. This elbow appears also in the normal volume curve of slow hearts, and probably corresponds to occurrence of the so-called third heart sound (protodiastolic gallop rhythm, "bruit de rappel," tá tă tă). As has been stated, there is now good evidence that the mitral valves close passively about this time, and that this diastolic closure of the valves may cause the third sound. It will be noted that according to this explanation of the third sound it is to be considered not an *opening* snap of the auriculo-ventricular valves (as thought by Potain and Sansom (5)) but a *closing* snap due to the diastolic closure. The latter explanation is further borne out by the electrophonographic curves of Einthoven (6) which show that the sound occurs about eighteen hundredths of a second after the second sound at a point at

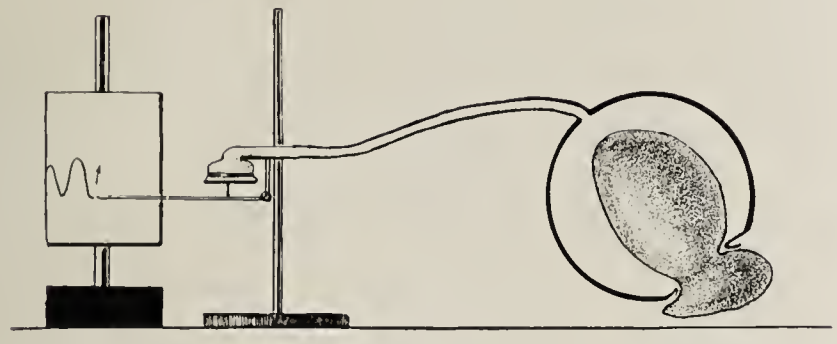

FIG. 1.—Cardiometer and its connection with recording tambour.

FIG. 2.—Cardiometer in place around the auriculo-ventricular groove, showing the position of the ligature when tightened to produce the stenosis.

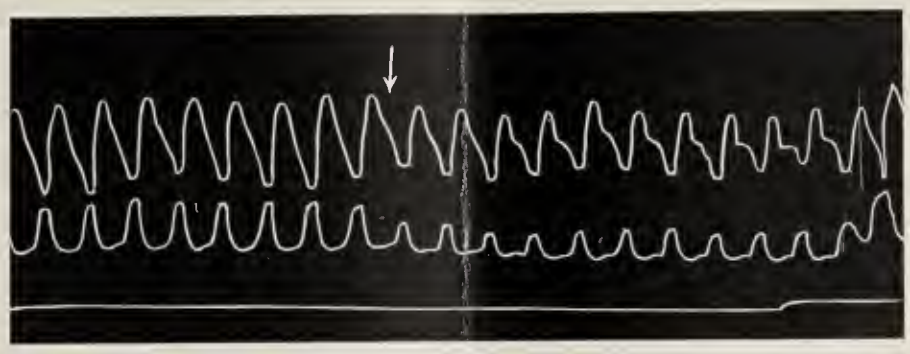

FIG. 3.—Mildest grade of mitral stenosis (produced after the arrow).
Upper curve = volume of the ventricles (upstroke representing systole, downstroke diastole).
Lower curve = carotid pressure tracing with Huerthle membrane manometer.
Lowest line = base line.

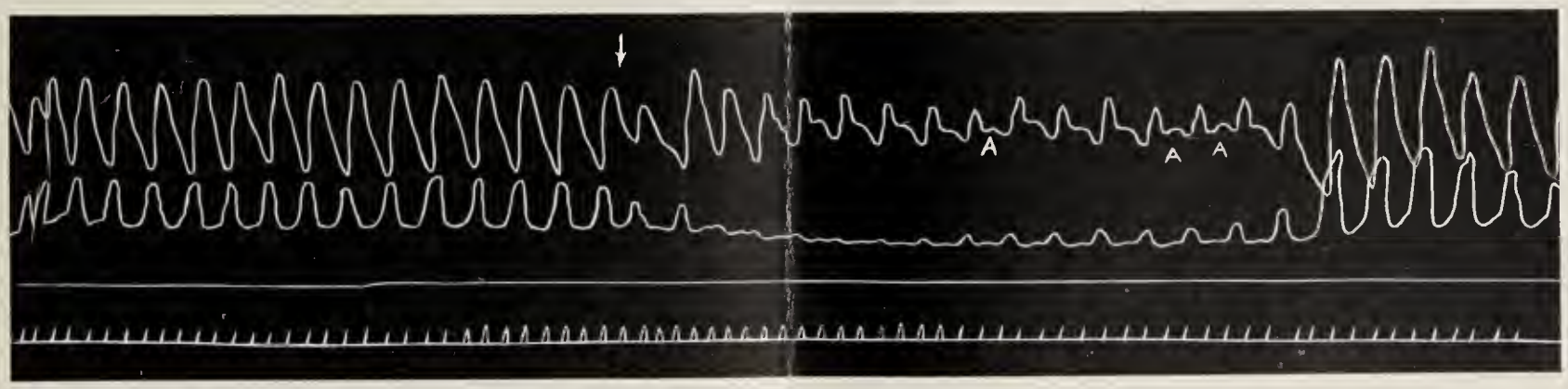

FIG. 4.—More severe grade of stenosis after arrow. Curves as before, showing almost complete disappearance of the auricular wave at *A*, *A*, *A*. Lower line shows time marking in 1/5 seconds.

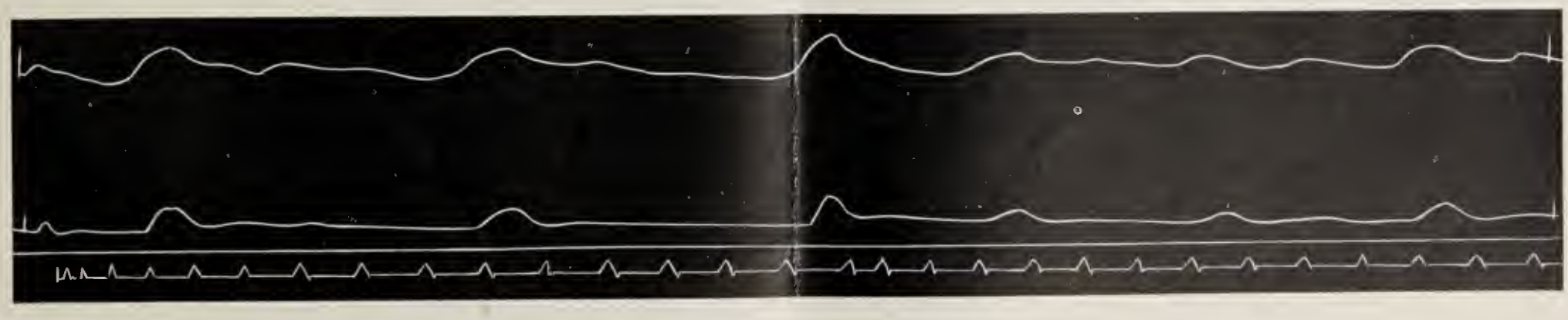

FIG. 5.—Curves as before taken at high speed with very marked degree of mitral stenosis (third stage), showing absence of auricular wave.

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which filling has been occurring for a considerable time. Thayer has also shown it to correspond to an interesting wave upon the volume curve which he thinks marks the end of ventricular filling. In mitral stenosis, as has been stated by Thayer, this sound occurs sooner after the second sound than in normal hearts, and in the volume curve in our experiments (compare Fig. 6, C^3 and E^3) it can be seen that the elbow also occurs much earlier in diastole.

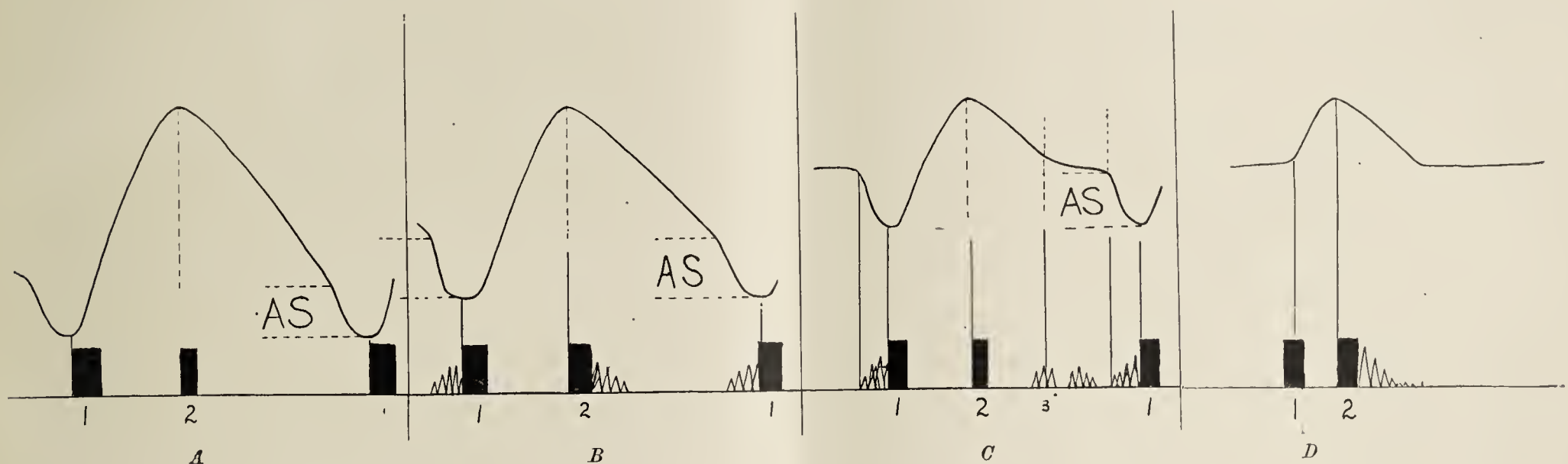
Galliverdin (7) has suggested that this sound is due to the shaking of the whole thickened anterior cusp under the influence of the dicrotic recoil above and the inflow from the auricle below. This explanation is possible but might be more readily applied to the early diastolic rumble than to the clear cut "bruit de rappel."

It is quite possible that owing to the variations in the duration of diastole, sounds which appear to be mid-diastolic are really the same as those which with longer diastoles would fall definitely into either the protodiastolic or the presystolic category. At all events the volume curve shows nothing to explain the occurrence of a sound during the period of diastasis.

The volume curve does, however, explain why, as Mackenzie (8) has stated, the sounds produced passively in early diastole are decrescendo in character, while the presystolic sounds are crescendo. The former are produced by the inflow of blood into the ventricle under the influence of the venous pressure, which decreases progressively as the overloaded auricle empties itself. Hence the sounds which it produces decrease. The latter are due to systole of the hypertrophied auricle whose force only gradually reaches its maximum, and hence finds expression in crescendo.

The rare blowing murmur of early diastole, which, as Mackenzie states, is also decrescendo in character, is probably produced by the first passive inflow into the ventricle in the manner usual for blowing murmurs, namely, when the orifice is reduced to a mere slit. In this connection it must be added that it can be readily demonstrated upon the excised dead heart that whenever there is a slight obstruction to inflow from the auricle and the inflow takes place at low pressure, the cusps of the mitral valve remain approximated along the greater part of the line of closure, and are separated only along a small portion of their extent. In this way the functional orifice is much smaller than the actual orifice, and the *relative* stenosis adds itself to the organic stenosis. A narrowing of the channel sufficient to give rise to a blowing murmur might thus readily occur and be transitory in character, a fact which would correspond to the transitory character of such blowing murmurs observed clinically (Bard). Certain it is that the blowing diastolic murmur heard at the apex, in the left axilla and back, but not over the aortic or pulmonic area, deserves more attention as an occasional physical sign in mitral stenosis than is usually accorded to it.

In passing, it must be added that it can be readily demonstrated upon the excised heart that when a certain pressure is maintained in the ventricle, and when this pressure approxi-



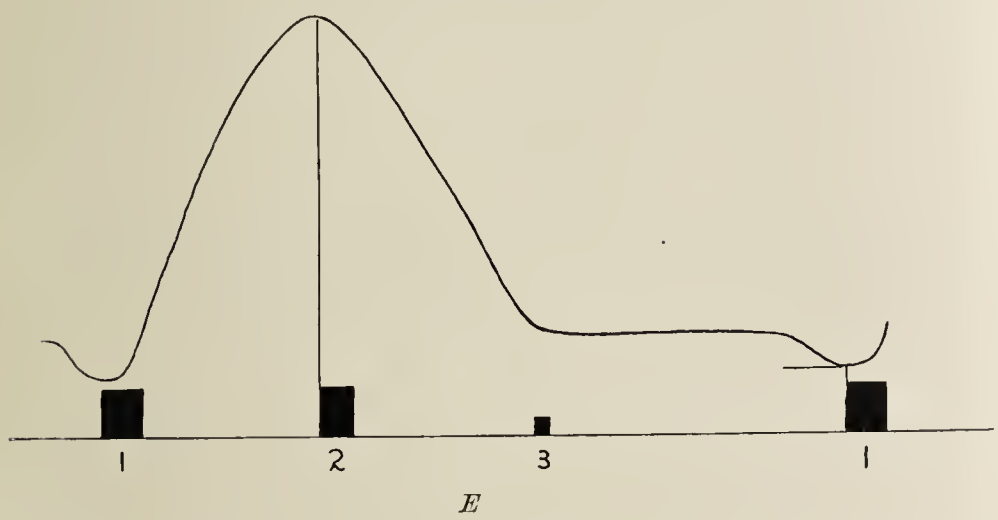


FIG. 6.—Diagram of volume curve in progressively increasing mitral stenosis.

A. Normal curve at normal rate. AS = portion of filling due to auricular systole.

B. Mitral stenosis, mild grade, showing decreased volume, slowed filling, and greater importance of the auricular element in the curve.

C. Medium grade of stenosis, showing diminished filling, early onset of diastasis, and the large amount of output from the auricles.

D. Severe grade of mitral stenosis (third stage), small systolic output, early diastasis, absence of auricular systole.

E. Normal volume curve, slow heart rate, showing diastasis under normal conditions. Solid black lines represent normal heart sounds, zig-zag lines represent murmurs.

mates the pressure in the auricle, the mitral cusps no longer open to their full extent, but the opening is reduced to a small space near the middle of the cusps. A functional mitral stenosis is produced. When the auricular pressure is further increased or the pressure within the ventricle diminished, the cusps again open along their whole line of closure.

The existence of such a functional mitral stenosis in aortic insufficiency is assumed by Bard (l. c.), though he gives no actual demonstration of its production. He believes that this functional mitral stenosis is responsible for the presystolic rumble (Flint murmur) of aortic insufficiency, a theory which would be in perfect accord with the above-mentioned experiment.

Upon the limitation of the thrill and murmur of mitral stenosis to a small area about the apex, one of my experiments seems to throw some light. In a dog whose tricuspid valve was slightly incompetent, owing to some sclerotic thickening along the greater part of the line of closure, a systolic thrill could be felt along the wall of the right auricle, but only over a line about three millimeters wide exactly opposite the point where the leak was taking place. At no other points could the thrill be felt. This thrill was therefore due to the direct impact of the regurgitant stream against the wall of the auricle, and not to any low pitched vibrations of the wall as a whole. It seems probable that localized thrills and also murmurs may arise thus at the points where the narrow stream strikes against the heart wall. It can easily be demonstrated that the stream passing through the narrowed mitral orifice is just such a narrow stream, whose direction is, as a rule, toward the apex. In aortic insufficiency the impact of the stream would be diminished by the pressure encountered within the ventricle, and the thrill produced would be, as is observed clinically, rarer and less intense than that of mitral stenosis. Moreover, the intensity of the thrill would be reduced proportionately more than the murmur, so that the latter would remain after the former had disappeared.

I desire to express my thanks to Mr. Julian M. Wolfsohn for his valuable assistance in the execution of these studies, and to the authorities in charge of the Hunterian Laboratory of the Johns Hopkins University for the privilege of pursuing them there.

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CONTRIBUTIONS TO THE STUDY OF AURICULAR FIBRILLATION, PAROXYSMAL TACHYCARDIA, AND THE SO-CALLED AURICULO-(ATRIO-)VENTRICULAR EXTRASYSTOLES.

By Arthur D. Hirschfelder, M. D.,
Associate in Medicine, Johns Hopkins University.

(*From the Medical Clinic of the Johns Hopkins Hospital and University.*)

Ludwig and Hoffa (1), Einbrodt (2), Sigmund Mayer (3), Vulpian (4), Neumann (5), Fischel (6), and Trendelenburg (7) have investigated the effects of direct electrical stimulation of the mammalian heart, and have found that weak stimuli, either faradic or galvanic, bring about a sudden increase in rate in the chamber stimulated, while strong stimuli throw it into a state of fibrillation. If the electrodes be applied to the auricle alone, the tachycardia is communicated to the ventricles as well, and the rate of the entire heart is increased. The peculiarity of this increase lies in the fact that it is described by some of these writers as a doubling of the pulse rate, a description which was later applied by August Hofmann (8) to the change of rate ushering in the attacks of paroxysmal tachycardia. Similar sudden changes in rate have also been recorded by v. Ziemmsen (9) during galvanization of a human heart which was separated from the electrodes by only the skin and pericardium. As is readily seen from a study of their curves and from the results obtained by repeating their experiments, this so-called doubling is not an exact one, but ranges from 1.6 to 2.1 : 1 instead of exactly 2 : 1.

If the ordinary electrodes are applied to any part of the auricles, or fish-hook electrodes are inserted into the auricular wall, and a weak faradic stimulus applied, no change of rate is observed. If the stimulus is increased, auricular contractions suddenly increase from 1.6 to 2.1 times the previous rate, each auricular being followed by a ventricular contraction. The conduction time is usually lengthened when the

stimulus is a comparatively weak one (Fig. 1). The rate is usually regular, and both rate and conduction time return to normal at once when the stimulation ceases.

Occasionally the rhythm of both auricles and ventricles is irregular, sometimes interrupted by pauses. The rhythm of the ventricles is more irregular than that of the auricles, owing to the diminution in both conductivity and contractility. Fischel has shown, moreover, that when the right ventricle is dilated after an intravenous salt infusion, its contractions manifest an irregularity in force, while the left ventricle, which is not subjected to the strain, remains regular. When the intensity of the stimulus to the auricles is augmented, the irritability of the heart seems to be greatly increased. The tachycardia begins as before, with a rate about the same as when weak stimuli are employed, but its duration outlasts the period of stimulation (Fig. 2). The return to the normal rate occurs spontaneously, suddenly, and without warning. The conduction time during the tachycardia is diminished, but returns to normal at the normal rate. Between attacks the heart rate may be quite irregular, being interrupted by typical auricular extrasystoles, with normal or lengthened conductivity, shortened bigemini (shortened compensatory pause), and also by other extrasystoles of a peculiar type, which will be discussed in a subsequent paragraph.

When the intensity of the faradic stimulation is still further increased (the coil being pushed up as far as possible, and two dry cells used in the primary circuit), the contractions of the auricles assume a less co-ordinated character. The rate increases very greatly and contractions become shallow, irregular and difficult to record. At a certain stage they pass into a state of typical fibrillation (Fig. 3). However, the rapidity is so great and so irregular and the contractions so shallow that it is impossible to determine exactly the point at which co-ordinated contraction of the entire chamber disappears. The rate of the ventricle as a rule is not affected by the transition to auricular fibrillation, but continues, as before, at approximately twice the normal. Occasionally, and especially when the heart is very irritable, the onset of auricular fibrillation brings about fibrillation of the ventricles as well, after which the dog's heart does not usually recover.[1]

The intensity and duration of these changes seem to bear a definite relation to the irritability of the heart as well as to the strength of stimulus. In some hearts, especially in those of strong dogs which had not been subjected to prolonged operations, prolonged fibrillation set in after faradization of one- or two-fifths of a second. In others it required much longer and more intense stimulation to produce the same effect. However, it was observed usually that if several short stimulations succeeded one another at short intervals they exerted a cumulative effect, that of the last being by far the greatest and most prolonged. In other words, the irritability, rhythmicity and conductivity seemed to be increased by the faradization, but the effect upon irritability seemed to outlast that upon either rhythmicity or conductivity, since both of these properties return to normal during the intervals between tachycardias, while the response to a given stimulus is increased. Conductivity is not affected during these intervals (since the conduction time is then normal), but it varies with the changes in rhythmicity, as stated above.

The fibrillation of the auricles sometimes ceases after vagus stimulation, and the rate of the whole heart returns to normal (Fig. 4); sometimes its effect is only momentary and the fibrillation and tachycardia are resumed (Fig. 5).

The changes which accompany faradization of the ventricles resemble those of faradization of the auricles in many ways. When the stimulus is a weak one there is no response; when it is moderately intense the ventricular rate suddenly increases, exactly as is the case with the auricle when that chamber is stimulated. The rate is nearly but not exactly double the normal, and commences and subsides within one or two cardiac cycles. The auricle does not respond to the ventricular rhythm, but continues at its own original rate. When the stimulus is further increased, fibrillation of the ventricles occurs, and the cardiac action becomes paralyzed unless it be revived by stimulation of the vagus (Garrey).

Considerable interest attaches itself to the peculiar extrasystoles by which the interval between auricular and ventricular contraction is shortened, in some cases even to the point of almost absolute synchronism between the two chambers. This condition was first studied by James Mackenzie (11), who described it as "Inception of the Rhythm of the Heart by the Ventricles" and thought that it was due to overexcitation of the fibers joining the auricles and ventricles (fibers of the His bundle). As he thought that they arose in the nodal portion of this bundle, he termed them "nodal extrasystoles." Hering and Rihl (12) reached the same conception a year later, designating them as "atrio-ventricular extrasystoles," and state that this diagnosis can be made whenever the a - c interval accompanying the extrasystole is shorter than that with the preceding regular beat. These opinions, however, are based entirely upon *a priori* reasoning and not upon laboratory experiment. Lehmann, the only observer who has published experiments upon stimulating the bundle directly, did so by stimulating all the tissue within the heart-block clamp, and thus stimulated both auricle and ventricle directly even more than the His bundle. Needless to say such evidence is of no value.

On the other hand, in our experiments there was no stimulus applied to the His bundle or to any portion of the cardiac musculature in the vicinity of the sinus or conducting system. The stimulation affected the auricular appendix directly and it alone (Fig. 6). We are, therefore, confronted with two possible explanations of the occurrence of these extrasystoles: Either they are to be regarded as representing merely a special type of auricular extrasystole in which increase in conductivity is associated with increase in irritability; or it is possible that when an abnormal stimulus is applied to any part of an auricle whose irritability is markedly increased, the impulse may spread at once to the cells of the conduction system

[1] Garrey (10) has shown that peculiar sudden increases of rate follow chemical stimulation of the cardiac nerves in dogs.

and stimulate them to autonomic contraction and to a series of abnormal contractions such as were observed by Gaskell (13) to follow stimulation of the corresponding fibers in the heart of cold-blooded animals. The effect upon these cells, though a secondary phenomenon, might overshadow the effect upon the auricles.[2]

The conditions in our experiments were, therefore, not quite analogous to those in Mackenzie's cases, in which such extrasystoles occurred. In these cases degeneration, arteriosclerosis and fibrous myocarditis within the bundle of His were revealed at autopsy, and Mackenzie believes that these changes acted as irritating lesions upon that structure. It seems highly probable that this explanation applies to such cases.

In our experiments, however, no changes in the His bundle were present. On the other hand, in a very large number of experiments in which hæmorrhages into the His bundle and its vicinity were produced by the introduction of the Erlanger clamp, I have never seen any such extrasystoles occur singly or in groups, nor do they ever occur during the tightening of the clamp.

Whichever explanation may be correct, it is certain from the above experiments that extrasystoles with shortened conduction time may arise as a result of stimuli applied directly to the auricle, and need not necessarily indicate the presence of an irritative lesion within the bundle of His or even within the system of Purkinje fibers, *i. e.*, in the muscular path between the coronary sinus, the septum membranaccum and its intramuscular and subendocardial ramifications in the ventricles, as claimed by Mackenzie.

The clinical significance of the above-mentioned experiments lies in a certain parallelism between the phenomena observed and attacks of paroxysmal tachycardia in man. The conceptions of the latter condition are not very clearly defined. It seems certain at present that we must differentiate sharply between those cases in which the rate gradually increases and does not reach its maximum for a minute or two, and those in which the rate becomes approximately doubled, trebled or quadrupled within one or two cardiac cycles.

The former group is common in neurotic individuals, convalescents from typhoid fever and other infectious diseases, and hyperthyroidism, and represents simply an exaggeration of the normal changes of rate under the influence of emotion, excitement, etc. That is, the tonic activity of the vagus diminishes, and the influence of the accelerators predominates during the periods of tachycardia, while the balance is restored when the rate returns to normal.

The cases in which the onset and cessation of tachycardia are so sudden that they occur within one or two cardiac cycles represent the group which may properly be designated as idiopathic paroxysmal tachycardia. As stated above, August Hofmann (l. c.) called attention to the fact that the change in rate represented an almost exact sudden doubling or quadrupling, with subsequent sudden return to the preceding rate. Trebling of the rate has also been described, but doubling is most common. However, in most of the cases reported the ratios have not been absolutely mathematical, and such changes as from 80 to 140 (1 : 1.7) are seemingly more common than the exact doubling.

Hofmann ascribed the change in rate to the existence of a sino-auricular heart block (2 : 1 rhythm) which passed off during the paroxysm, so that the auricles and ventricles then beat at the same rate as the sinus, while in the interim they were responding to only alternate impulses from the sinus. Although there would seem to be no *a priori* objection to this explanation, no cases have been reported which demonstrate its clinical existence, the nearest approach being a case published by me (14) but which is susceptible of a different classification.

That the disturbance in these cases with sudden changes of rate is not merely a disturbance in the physiological antagonism of vagi and accelerators was proved by Gerhardt (15), and by myself, since it was possible to paralyze the vagi of our patients with atropin without bringing on an attack. I further showed that the stimulation of the unrestrained accelerators due to mild exercise undertaken while the effect of atropin was at its height, was also insufficient to bring on an attack.

The reported cases, accompanied by venous tracings, which alone are worthy of record, seem to fall into two distinct groups. First, those characterized by the presence, during the attack, of a wave due to auricular contraction before each ventricular contraction. The attack subsides by exact halving of the rate, though the rate of the auricle persists. There is evidently a partial heart-block (2 : 1 rhythm) between the auricles and the ventricles, associated with an abnormally high auricular rate. This latter factor may in itself bring about fatigue of the His bundle, whose occasional recovery causes the return to the full rate, the onset of the paroxysmal tachycardia. A considerable number of cases belonging to this group have been reported especially by Hofmann (l. c.) Gerhardt (l. c.), Rihl (16), and Schmoll (17).

Second, those cases in which the venous pulse is of the ventricular type during the attack, of the normal auricular type between attacks, and where no signs of atrio-ventricular block (2 : 1 rhythm) are ever present. On the other hand, after the attacks there may occur an irregularity due to the presence of extrasystoles with shortened conduction time. Cases of this group have been described by Mackenzie, myself, and others.

It should be noted that these attacks of paroxysmal tachycardia very closely resemble the experimental tachycardias of auricular origin which were described in the first part of this paper. The wave due to auricular contraction disappears, as might be expected, if the auricles are in a state of fibrillation or their contractions become too weak to give a wave upon the venous tracing. The pulse rate rises suddenly to approxi-

[2] In favor of this view must be mentioned the fact that in certain extrasystoles as in No. 1, Fig. 6, the effect upon the ventricle is much more evident than upon the auricle. Either the auricular extrasystole is here absent or the extrasystole is too feeble to be recorded. Nevertheless, the *original* stimulus for these extrasystoles affected the auricle and not the His bundle or the sinus, to which it might have been communicated.

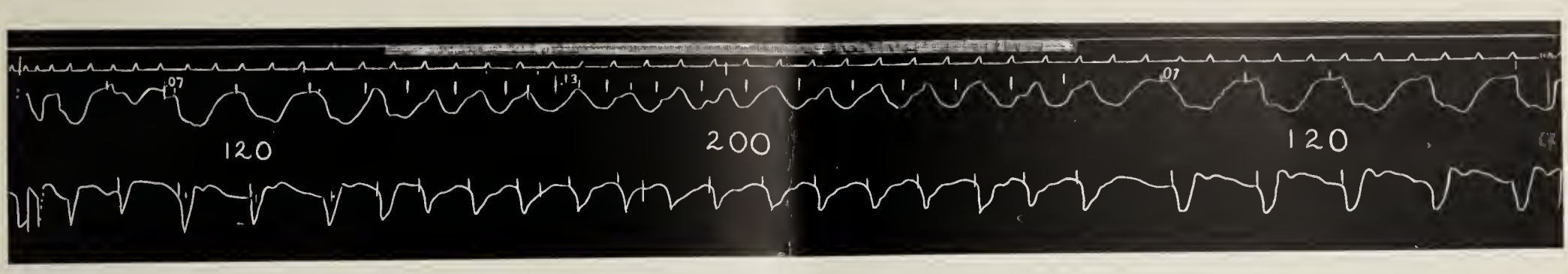

FIG. 1.—Weak faradization of right auricle. The figure shows a heart with rate of 120 per minute, and conduction time .07 second. During stimulation the rate rises suddenly to 200, the conduction time to .13 second. On cessation of stimulation both fall suddenly to normal.

Upper line = stimulation.
Second line = time in 1/5 second.
Third line = contractions of right ventricle (down-strokes).
Fourth line = contractions of right auricles.

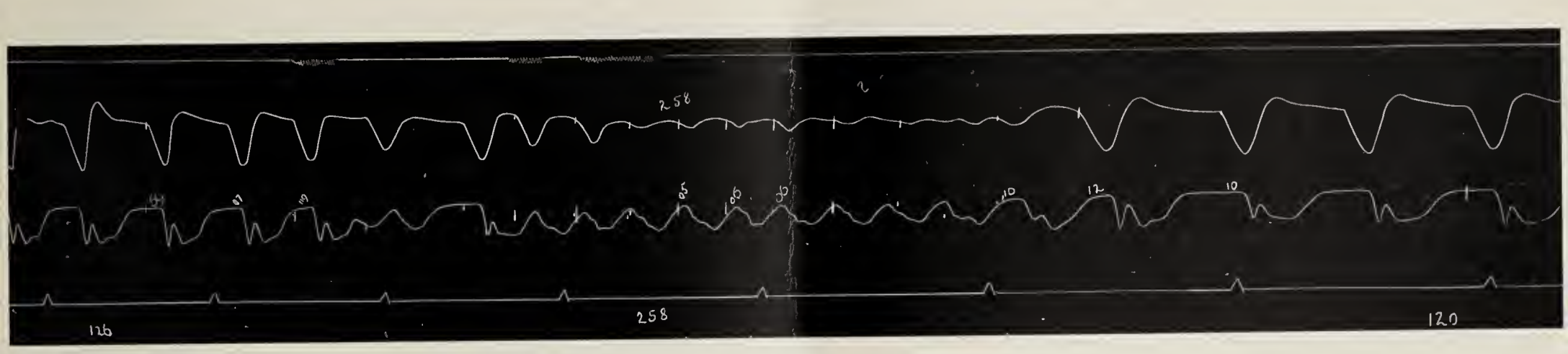

FIG. 2.—Faradization of right auricle with strong stimulus repeated at short intervals. Heart rate rises from 126 to 258 per minute during a period which outlasts the stimulus; and falls spontaneously to 120 after about 2½ seconds. Conduction time falls from .09 to .06 during the tachycardia; rises to .10 after rate becomes slow.

Upper line = stimulation of auricle.
Second line = auricular contractions.
Third line = auricular contractions.
Lowest line = time in seconds.

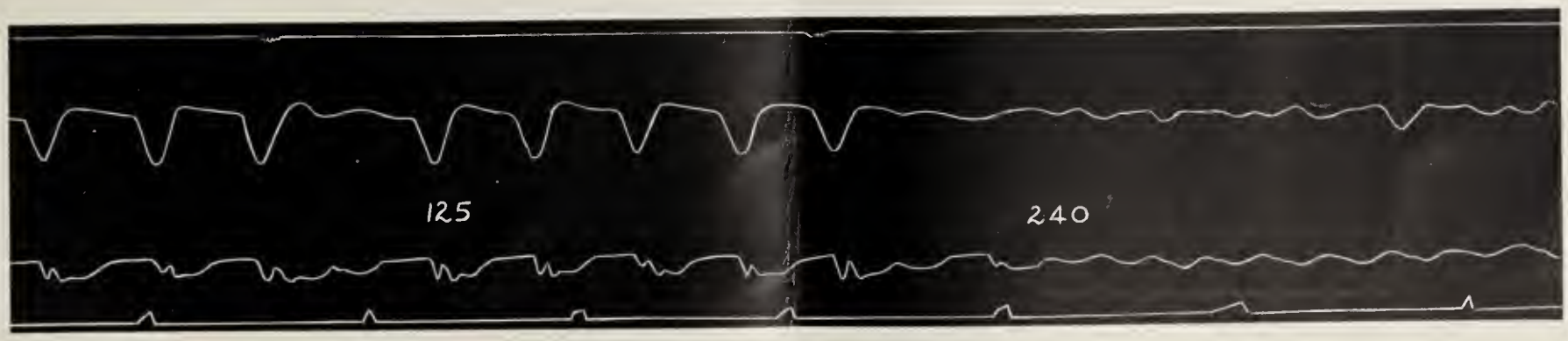

FIG. 3.—Onset of auricular fibrillation after short faradic stimulation of an irritable auricle. Order of curves as in Fig. 2. Fibrillation of auricles and regular tachycardia persisted for several minutes.

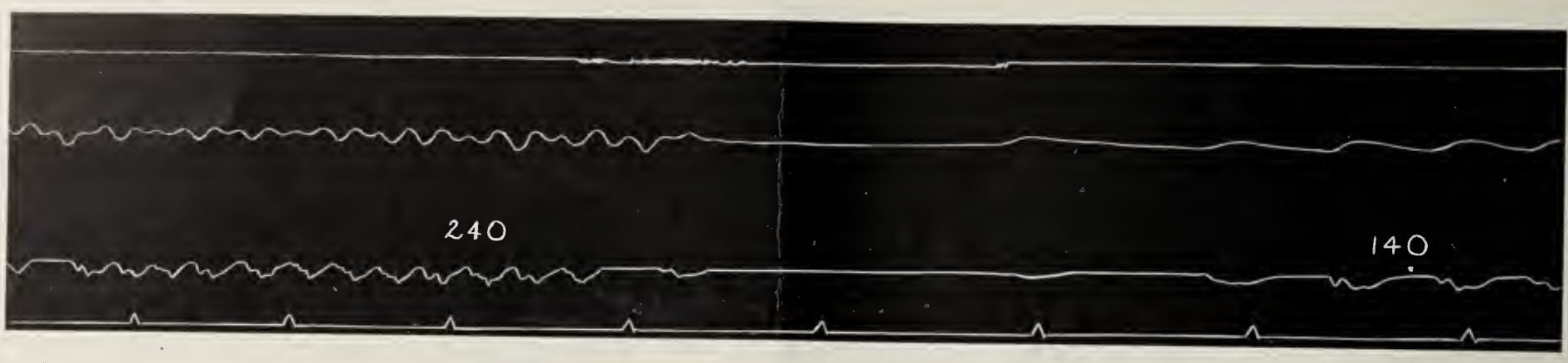

FIG. 4.—Cessation of auricular fibrillation under the influence of maximal stimulation of the vagus. Fall of rate from 240 to 140. Upper line represents stimulation of the vagus: curves otherwise as in Figs. 2 and 3.

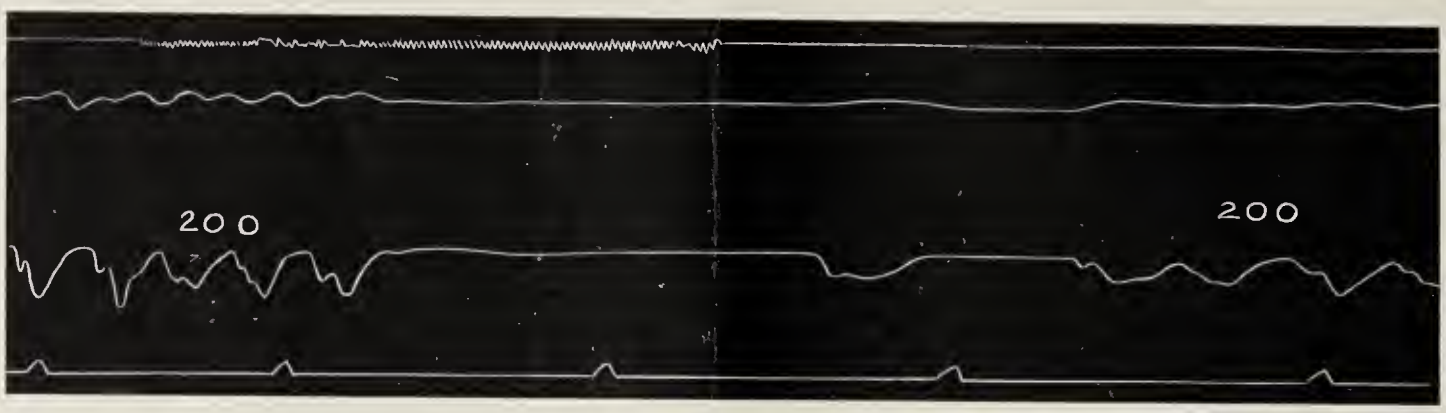

FIG. 5.—Same as Fig. 4, except that the heart was more irritable and resumed the rapid rate as soon as the vagus stimulation passed off.

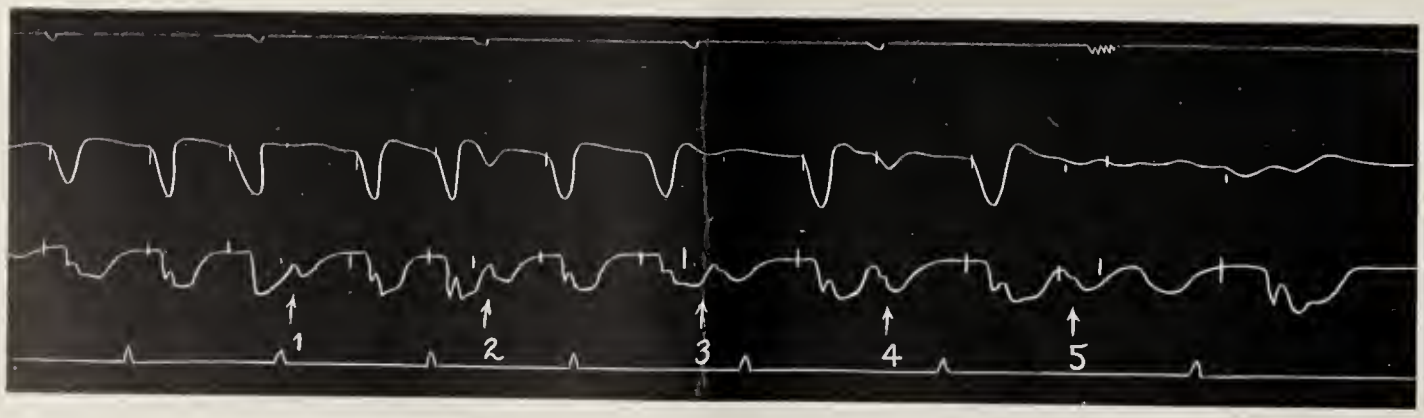

FIG. 6.—Direct faradization of right auricular appendix. Extrasystoles with normal conduction time (1, 2, and 3) and also with shortened conduction time (4 and 5); almost synchronous in auricles and ventricles

mately double the normal. The mild attacks cease upon vagus stimulation, the severe ones continue in spite of it. After an attack has subsided, extrasystoles with shortened conductivity may be present. This condition has further many points in common with the paroxysmal irregularity which Cushny and Edmunds (18) described in some clinical cases, and also in dogs whose auricles manifested "spontaneous" fibrillation, and perhaps also with the sudden changes in rate which Garrey has observed to follow the chemical stimulation of cardiac nerves.

Moreover, Reid Hunt (19), and Cushny and Edmunds have seen the auricles of the dog pass into a state of fibrillation after cessation of vagus stimulation, although Garrey states that neither he nor Hewlett, who was working in his laboratory, had ever seen this occur unless the heart was already in a state of greatly increased irritability from the concomitant action of some other factor. My own experience tends to confirm this opinion.

A large number of cases have, moreover, been reported in which lesions of the central nervous system were found at autopsy, and not infrequently lesions involving the nucleus or fibers of the vagus (Reinhold, Hofmann, Pitres, Oppenheim (20), Schlesinger (21), or adhesions along the course of the vago-sympathetic (Pal). Occasionally the condition has been seen in association with epilepsy (Nothnagel, Schlesinger), in early tabes (Hirschberg), in multiple sclerosis (Müller), and in exophthalmic goiter (Hoesslin and Brown).

The question arises as to how these cases shall be classified. None of the paroxysms reported in these cases has been studied from the physiological standpoint, and their mode of onset and subsidence has not been considered. In the study of cases of exophthalmic goiter and hyperthyroidism under my observation, and of the charts of such cases from American and German clinics, I have seen none in which the pulse rate did not rise and fall gradually. The condition here is, therefore, merely an instability in the equilibrium between vagi and accelerators, and must be differentiated from the attacks typical of paroxysmal tachycardia, at least until all doubts as to the pathological physiology of the latter have been dispelled. For the present all classifications should be based upon only those cases which have been studied by means of venous tracings, if possible accompanied by autopsy findings, as has been done by Mackenzie and Keith. Investigations with the electrocardiogram will unquestionably throw much light upon the condition. Classifications based upon mere clinical associations without reference to the mode of onset or nature of the paroxysm, as has been attempted by Schmoll, can lead only to confusion in the present state of our knowledge.

These observations, taken in connection with the experiments mentioned above, throw doubt upon the theory first advanced by Mackenzie and subsequently advocated by Schmoll, that the lesion or disturbance which brings on the true paroxysmal tachycardia lies in the bundle of His or in the Purkinje cells of the conduction system, though this may apply to occasional cases. It seems more likely that *true paroxysmal tachycardia is usually caused by some one of a number of conditions which bring about a condition of increased irritability of the heart muscle*, especially of the auricles, which probably pass into a state of fibrillation. Just as in the animal a slight stimulus suffices to throw the heart into paroxysms of tachycardia under these conditions, so in man the act of defecation, slight emotional excitement, or sudden awakening from sleep represent stimuli which have been known to precipitate attacks.

The underlying condition of increased irritability of the heart muscle may be brought about either by some direct irritant lesion in the muscle itself, and especially in the auricular muscle or the Purkinje fiber system, or through the medium of the cardiac nerves. From the experiments it would appear that the frequent repetition or duration of action of the stimulus are fully as important as its intensity, and hence it need not be surprising that in man as in animal little evidence of the increased cardiac irritability or of the stimuli producing it can be seen between the attacks.

In conclusion I desire to express my thanks to the authorities in charge of the Hunterian Laboratory of the Johns Hopkins University for the privilege of pursuing these studies there.

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PLACENTAL SYPHILIS; A STUDY OF SYPHILITIC PLACENTÆ WITH REGARD TO THE PRESENCE OF THE SPIROCHÆTA PALLIDA.

By W. O. Pauli, M. D.,

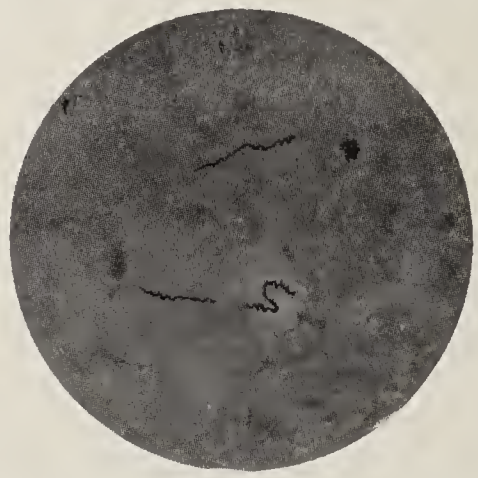
Medical House Officer, Johns Hopkins Hospital.

Since the discovery of the characteristic micro-organism of syphilis by Schaudinn and Hoffmann in 1905, various authors have reported positive findings of *Spirochæta pallida* in the placentæ of syphilitic infants; while, on the other hand, other investigators have searched for them with repeated negative results, but at the same time were able in the majority of cases to demonstrate the organisms in the fœtal organs. In view of these contradictory reports, the following work was undertaken at the suggestion of Prof. J. W. Williams.

A study was made of the syphilitic cases which presented themselves for treatment in the Obstetrical Department of the Johns Hopkins Hospital, in order to determine if possible, in what percentage of cases the *Spirochæta pallida* is demonstrable in placentæ presenting histological evidence of syphilis. This would afford a ready means of making a positive diagnosis of syphilis and thus enable the physician to institute proper prophylactic treatment against repeated miscarriages in subsequent pregnancies, and to place the child upon immediate specific treatment. Then, too, it is frequently stated in the literature, that it is doubtful whether the changes found on microscopical examination of the placenta are characteristic manifestations of syphilis or not, as the changes which are ordinarily so considered, may also be found in conditions not syphilitic. Thus, Mohn and others state that placental syphilis cannot be diagnosed without demonstrating the *Spirochæta pallida*. This, however, seems to be too drastic a postulate, for in a great majority of the cases, in which the gross and microscopical examination of the placenta reveals the characteristic features of syphilis, the *Spirochæta pallida* can be demonstrated in the fœtal organs, although none can be found in the placenta. As will be shown later, this affords sufficient evidence to make a positive diagnosis of syphilis of the placenta.

On gross examination, the characteristic signs of syphilis of the placenta are: (1) A relative increase in the size and weight of the placenta as compared to that of the child; the normal ratio being 1 to 6, while in syphilis it often increases and becomes 1 to 4 or even more. (2) The maternal surface instead of being dark reddish in color becomes pale pink, and has a greasy feel. (3) The fissures which mark off the cotyledons, are deep and wide in syphilis, as compared with the normal.

Examination of a teased specimen of the fresh placenta will often enable one to differentiate suspicious cases by careful examination of the villi. The procedure adopted in the routine examination of all placentæ in the Obstetrical Laboratory is to take a minute portion from the material surface of the placenta by means of a pair of forceps and then hold it



Micro-photograph of *Spirochæta pallida* in Fœtal Liver Tissue.

on a slide under the tap, so as to spread apart the branches of the villi and to wash away any blood clot; after which it is examined under the microscope. In syphilis, the branching is less delicate than normal, the ends of the finer branches are thickened and club-shaped: the blood vessels are usually absent in the finer branches and only poorly seen in the main villous stems, while the stroma is more opaque and presents a granular appearance.

On examining hardened sections of the placenta which have been stained with hæmatoxylin and eosin, the picture is almost typical. The short thickened branches of the villi occupy the entire field, obliterating the interspaces, the stroma is dense and the nuclei of the connective tissue cells appear

in great numbers, while the blood vessels are obliterated, due to an endarteritis and only few red blood cells are seen in the vessels of the larger villi.

During the 12 months extending from July, 1907, to July, 1908, 825 placentæ were examined, and among these there were 25 diagnosed as syphilitic after microscopic examination of sections by Prof. J. W. Williams. Autopsies were obtained on 16 out of 25 infants, in 14 of which an anatomical diagnosis of congenital syphilis was made. Such a diagnosis was based upon the increase in size and weight of the liver and spleen, the presence of pneumonia alba in the lungs, and of

When the tissue sinks in the water the blocks are transferred to brown bottles containing 1.5 per cent solution of silver nitrate and placed in the thermostat at 37° C. for three days. They are then rinsed in distilled water and immersed in 4 per cent solution of pyrogallic acid containing 4 per cent formalin. After remaining in the thermostat for 24 hours longer, until reduction has taken place, it is removed to room temperature and washed, dehydrated, and cleared in aniline oil and xylol, then mounted in paraffin. The sections are cut as thin as possible, usually 3 to 5μ, and mounted without a counter stain and examined under the oil immersion lens of the microscope.

No.	Aet.	Color.	Marital.	Parity.	Luetic history.	Period of gestation.	Length of fetus.	Condition.	Anat. diag.	Weight of fetus.	Weight of placenta.	Relative prop. wts.	Mic. exam. placenta.	*S. pallida* in placenta.	*S. pallida* in fœtal organs.
										Gms.	*Gms.*				
5588	17	Wh.	S.	0p.	June, 1907.	9 mos.	45 cm.	Still born.	Cong. lues.	2620	1020	1 : 3	Syphilis.	Negative.	Positive.
5687	19	Bl.	S.	Ip.	Denied.	7 "	37 "	Macerated.	No autopsy.	640	250	1 : 3	"	"	.....
5758	17	Bl.	M.	0p.	Denied.	6 "	...	Macerated.	No autopsy.	920	350	1 : 3	"	"	....
5795	21	Bl.	S.	Ip.	Denied.	9 "	50 "	Macerated.	Negative.	2730	510	1 : 5	"	"	.....
5845	17	Bl.	S.	Ip.	Denied.	8 "	....	Macerated.	No autopsy.	....	370	....	"	"	.....
5868	25	Bl.	M.	IIp.	Denied, 1 miscarriage.	4 "	18 "	Not macerated.	No autopsy.	90	160	2 : 1	"	"	.....
5884	20	Wh.	S.	0p.	Dec., 1907.	7 "	36 "	Macerated.	Cong. lues.	1670	580	1 : 3	"	"	Positive.
5896	18	Bl.	M.	Ip.	Denied.	9 "	48 "	Macerated.	No autopsy.	3150	590	1 : 5.3	"	"	.....
5929	15	Wh.	S.	0p.	Denied.	9 "	46 "	Pemphigus.	Cong. lues.	2595	650	1 : 4	"	"	Positive.
5944	19	Wh.	S.	0p.	Denied.	8 "	39 "	Macerated. 4 days.	Cong. lues.	1780	910	1 : 2	"	"	Positive.
5971	34	Wh.	M.	IIp.	Denied, 5 miscarriages.	9 "	46 "	Macerated.	Cong. lues.	2590	800	1 : 3.2	"	"	Negative.
5975	19	Bl.	M.	IIp.	Denied.	7 "	34 "	Lived 5 days.	No autopsy.	1575	600	1 : 2.6	"	"	.....
6009	18	Bl.	S.	0p.	Denied.	7 "	33 "	Lived 2 days.	No autopsy.	900	260	1 : 3.5	"	"	.....
6026	29	Bl.	M.	VIIp.	Denied, 2 miscarriages.	8 "	40 "	Still born.	No autopsy.	1350	340	1 : 4	"	"	.....
6170	18	Wh.	M.	0p.	Denied, 1 miscarriage.	9 "	45 "	Macerated.	Cong. lues.	2250	560	1 : 4	"	"	Positive.
6174	24	Bl.	M.	Ip.	Feb., 1906.	7 "	34 "	Macerated.	Cong. lues.	1050	280	1 : 3.8	"	"	Positive.
6175	32	Bl.	M.	Ip.	Aug., 1906.	9 "	45 "	Macerated.	Cong. lues.	2150	480	1 : 4.5	"	"	Positive.
6204	19	Bl.	M.	Ip.	Denied.	9 "	46 "	Macerated.	Cong. lues.	2320	580	1 : 4	"	"	Positive.
6210	24	Bl.	S.	Ip.	Denied.	5 "	25 "	Still born.	No autopsy.	440	210	1 : 2	"	"	.....
6224	26	Bl.	M.	IIp.	Jan., 1905.	9 "	47 "	Macerated.	Cong. lues.	1800	400	1 : 4.5	"	"	Positive.
6239	24	Wh.	M.	0p.	Feb., 1908.	7 "	35 "	Macerated.	Cong. lues.	1920	470	1 : 2	"	"	Positive.
6297	16	Bl.	S.	0p.	Denied.	5 "	Twins { 24 cm. No. 1 25 " No. 2	Macerated.	1. Cong. lues. 2. Cong. lues.	290 300	430	1 : 1.4	"	"	1. Neg. 2. Neg.
6310	20	Bl.	S.	Ip.	Mar., 1908.	8 "	41 cm.	Macerated.	Cong. lues.	1510	420	1 : 3.6	"	"	Positive.
6356	17	Bl.	M.	0p.	June, 1908.	8 "	41 "	Lived 12 hours.	Cong. lues.	1500	500	1 : 3	"	"	Negative.

definite osteochondritis at the epiphyseal line of the long bones. The anatomical diagnosis was confirmed by the demonstration of the *Spirochæta pallida* in 11 cases, while five others proved negative.

The placenta was examined for the *Spirochæta pallida* in 24 of the 25 cases; in one case the tissue was thrown away by mistake, but positive results were obtained in no case, in spite of careful and repeated search. The Levaditi method of impregnating the tissue with silver nitrate and reducing by pyrogallic acid solution was used in every case. The procedure is as follows: thin blocks of tissue are hardened in 10 per cent formalin for 24 to 48 hours, then transferred directly to 95 per cent alcohol for 24 hours and washed in distilled water.

Sections were cut from only one block of tissue, excepting in two cases in which blocks were taken from two different portions of the placenta. Although careful search was repeatedly made, in not a single instance was it possible to demonstrate a typical *Spirochæta pallida* in the placenta, while they were found in large numbers in the fœtal organs in 11 cases.

A summary of the 24 cases is given in the accompanying table.

Upon reviewing the literature on the subject it is found, that a few isolated cases have been reported, in which the *Spirochæta pallida* was demonstrated in the placenta, but in these cases the number of organisms were usually very limited, and long and tedious search was necessary in order to

find them, so that Baum, in his text-book of Obstetrics states that the *Spirochæta pallida* is practically never found in the placenta.

Including the various individual cases reported in the literature, I have been able to collect 120 syphilitic placentæ which were examined for the *Spirochæta pallida* with positive findings in 16 cases.

	No. of placentæ examined.	*S. pallida* found.
Paaschen	5	5 cases.
Versé	2	0 case.
Schultz	2	1 "
Menetrier and Duval	1	1 "
Wallich and Levaditi	13	1 "
Huebschmann	1	1 "
Mohn	16	6 cases.
Bab	39	2 " doubtful.
Tissier and Girauld.	17	1 *S. pallida.*

L. Tissier and Girauld examined 40 cases of suspected syphilis, occurring during the course of three months in 323 admissions at the Maternity Division of the St. Louis Hospital at Paris. In the series there were 65 abortions, 9 of which presented signs of syphilis; 21 deliveries of a premature macerated fœtus; 3 deliveries at term of living infants of a doubtful nature. The placentæ were examined in 17 of the 40 cases and they found a single *Spirochæta pallida* in one instance. They also were able to demonstrate the *Spirochæta pallida* in the fœtal organs of 10 cases which were over six months' gestation, and emphasize the fact that they were unable to find any *Spirochæta pallida* in the organs of infants under six months' gestation.

Hans Bab, working in Professor Baum's clinic in Berlin, examined 39 syphilitic placentæ of which 37 proved negative and in 2 cases the findings were doubtful. He states that in not a single instance did he obtain a perfectly definite *Spirochæta pallida.* Felix Mohn on the other hand was more successful. He was able to demonstrate the *Spirochæta pallida* in 6 out of 16 syphilitic placentæ, but generally they were very few in number and at times only a single spirillum was detected. Moreover, where the *Spirochæta pallida* had been demonstrated in the placenta, as in the cases reported by Wallich and Levaditi, as well as by Menetrier and Rubens Duval, marked manifestations of congenital syphilis, such as pemphigus, were present in the fœtus.

The conclusions to be drawn from this study of the subject are (1), that the *Spirochæta pallida* is rarely found in syphilitic placentæ, and then only after long and tedious search. (2) That the anatomical changes observed in the placenta, are the result of toxins produced by the *Spirochæta pallida* in the fœtal organs and not to the immediate effect of the organisms upon the villi themselves. (3) The placenta is not the nidus of infection. The fact that the *Spirochæta pallida* is never found in the maternal portion of the placenta, but only in the blood vessels and stroma of the fœtal villi, would suggest that the placenta offers greater resistance to the invasion of the organisms, which is probably due to the steady flow of antibodies or immune substances from the mother through the maternal circulation.

In closing, I wish to thank Prof. J. W. Williams for the privilege of using the material in the Obstetrical Department and for the interest he has shown in the progress of the work.

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A METHOD FOR COMPLETE ENUCLEATION OF THE TONSIL.

By John A. West, M. D.,

Assistant Laryngologist, Out-patient Department, Johns Hopkins Hospital.

Owing to observations which have been made by internists and surgeons, as well as by laryngologists, showing the connection between the tonsils, as a portal of infection, and such conditions as rheumatism, endocarditis, enlarged glands of the neck, recurring peritonsillitis, etc., the complete enucleation of the tonsil has become an important operation, and it is for the laryngologist to develop as perfect a technic as possible for this operation.

Aside from minor details of little importance, the various methods so far described may be classed as follows: (1) Galvano-caustic dissection, advocated by Pynchon. Owing to the reaction likely to follow, this method finds few adherents. (2) Enucleation with the snare or ecraseur after having freed the tonsil from the pillars as recommended by Casselberry. It is claimed for this method that it is followed by less hemorrhage. This has been denied, and certain it is

that severe bleeding may follow the use of the snare; moreover, wounds made by snaring through tissues are, as a rule, followed by more reaction and do not heal as kindly as the clean cut wound of the scalpel. (3) Dissection by cutting the tonsil loose from the anterior pillar first, and then proceeding backwards. This is sometimes done with scissors (Robertson), or the operation may be begun with a knife and scissors, and finished with a snare (Goodale), or beginning by freeing the tonsil from the anterior pillar and proceeding backwards, the operation may in many instances be completed with a straight knife alone (Ballenger). This method of Ballenger, as will be seen further on, is open to objection only because at the last stage of the operation the hemorrhage may be so great that it is unsafe to continue with the knife. In view of this danger the operators using the anterior method usually complete the operation with a snare or ecraseur.

During the past year at the Johns Hopkins Hospital, with the encouragement of Dr. Mackenzie, who very kindly placed the material of the clinic at my disposal, I have been able to perfect a method which is different from any so far described, and which I have found to be not only entirely satisfactory, but preferable. Instead of attacking the tonsil from the anterior pillar first, it has been found of distinct advantage to free the posterior pillar from the tonsil as the first step in the dissection. On the surgical principle that clean cut wounds heal best, it is preferable to complete the operation with knives to the exclusion of the snare or ecraseur.

The method of procedure is as follows:

Preparation.

It is well to have the patient gargle the throat with some antiseptic solution, e. g., hydrogen peroxide or potassium permanganate, and if the crypts of the tonsil are filled with cheesy material, they should be washed out with a syringe.

Local is much to be preferred to general anæsthesia, as the hemorrhage is controlled more easily with the former, and, moreover, with local anæsthesia the patient himself can hold down the tongue with a depressor, which is often of assistance. Schleich infiltration is found to do excellently, about 10-20 cc. being injected at different points around the tonsil after swabbing the entire area of mucous membrane with a weak cocaine solution. With very nervous patients a hypodermic of morphia will help considerably.

Instruments, sponges, etc., must of course be sterilized.

Operation.

The operation may be divided into four steps:

I. The tonsil is grasped and pulled forwards with a pair of toothed forceps, and with an L-shaped knife (Fig. 7*a*), completely separated from the posterior pillar (Fig. 1).

II. Holding the tonsil again with the forceps and exerting traction towards the median line, with a straight knife (Fig. 7*b*), begin below the tonsil posteriorly at the point where the first incision ends, and make a circular cut around the tonsil meeting the first incision again at its upper end (Fig. 2). No attention is paid to the Plica triangularis.

III. Pulling the tonsil with the forceps well out into the mouth, and continuing with the same knife (Fig. 7*b*), begin above and posteriorly to cut through the loose connective tissue between the capsule of the tonsil and the superior constrictor muscle (Fig. 3). When there is little hemorrhage the dissection can readily be completed with this knife alone.

IV. When the hemorrhage is considerable and the field of operation thereby obscured, it is preferable after dissecting the tonsil perhaps three-quarters free, to complete the operation with a blunt-pointed knife (Fig. 7*c*), by entering the blade into the incision made below the tonsil (Step II), and

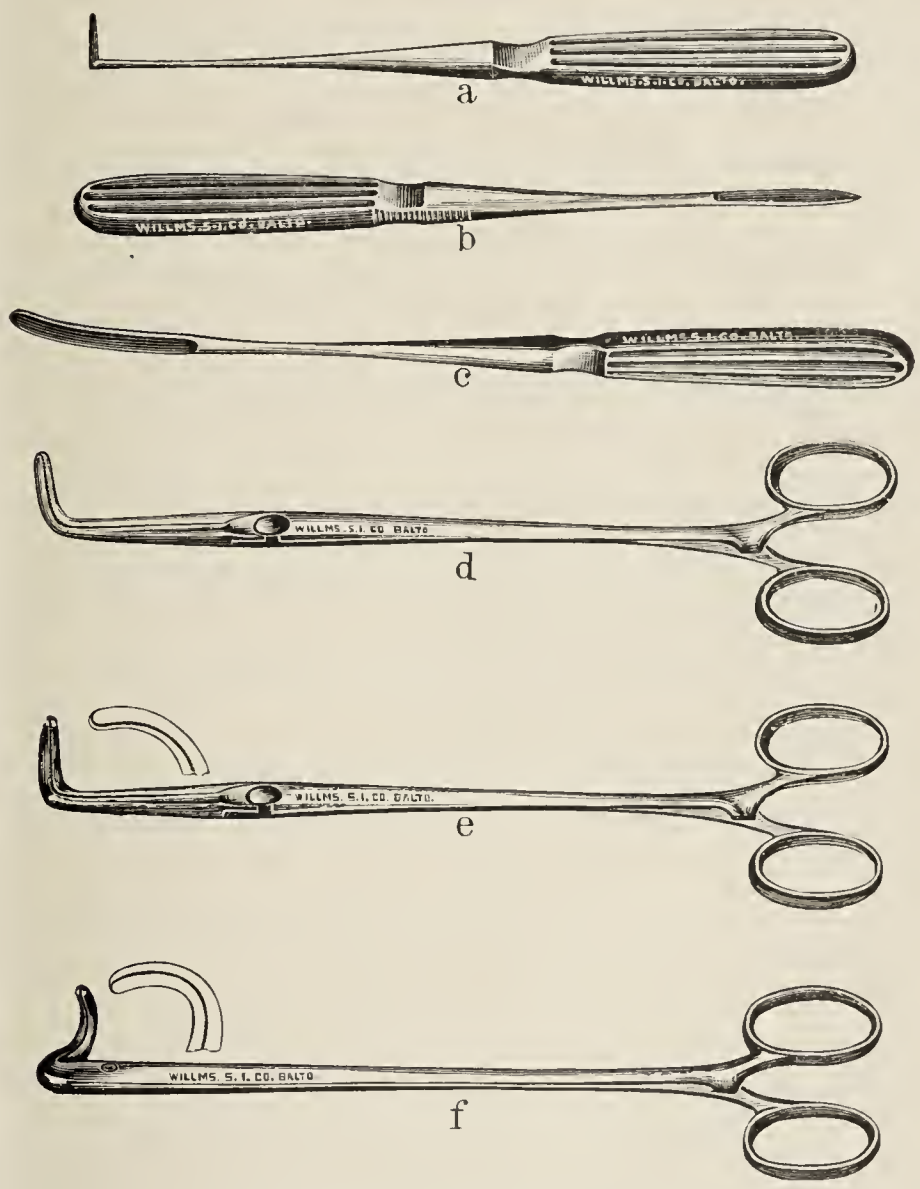

Fig. 7.—*a*. L-shaped knife for dissecting tonsil from posterior pillar in Step I of operation, as shown in Fig. 1.

b. Straight knife used in Steps II and III of operation (Figs. 2 and 3).

c. Blunt-ended knife for completing the enucleation as described in Step IV of operation and shown in Fig. 4.

d and *e*. Hemostatic forceps for clamping bleeding areas on the posterior and lateral part of the Sinus tonsillaris.

f. Hemostatic forceps for clamping bleeding areas on the posterior surface of anterior pillar.

cutting upwards (Fig. 4) to meet the incision (Step III), thus completely enucleating the tonsil with its capsule.

The three knives shown in diagram, having rather stout handles, which prevent turning in the hand, serve admirably for the work.

Time.

While the time actually occupied in enucleating a tonsil by this method is usually less than two minutes, the time from beginning to end of the dissection varies greatly, depending largely upon the patient. Where the throat is very sensitive the operation may be prolonged considerably, owing to the fact that retching may interfere with making the incisions accurately, and hence it is necessary to watch one's chance, so to speak, and to incise between the attacks of retching or gagging.

As the removal of both tonsils at one sitting is frequently quite a shock to the patient, it is often better, particularly in adults, to remove them at an interval of several days, unless the patient remains over night in the hospital, in which case both can be enucleated with safety at one sitting.

Control of Hemorrhage.

There is little danger from bleeding if the operator has had experience in controlling tonsillar hemorrhage, and if he is careful to stop *all* bleeding before leaving the patient. It is wrong to leave the patient when the hemorrhage has been controlled but partially, for oozing may continue for hours and a great deal of blood may be lost. The application of pressure and hemostatic clamps is to be preferred to such hemostatic drugs as the preparations of iron. When the latter are used a large clot of blood usually forms in the Sinus tonsillaris, from behind which a steady stream of blood, at times not at all easily discovered, may be running down the pharynx. Patients have bled to death in a few hours where this method has been used.

The following procedure for controlling the hemorrhage has been found entirely satisfactory and practically eliminates the danger. At the moment of completing the enucleation of the tonsil the bleeding is usually brisk, and a plug of sterile gauze is at once pressed tightly into the cavity between the pillars of the fauces, with an ordinary pair of nasal forceps. This usually stops most of the smaller vessels within a few minutes. Should the hemorrhage continue a long time, the bleeding areas are caught with specially constructed clamps, as the ordinary surgical hemostatic forceps are not well adapted to clamping in the Sinus tonsillaris behind the anterior pillar. The clamps (Figs. 7*d* and *e*) are suited for holding bleeding areas on the posterior and lateral part of the cavity, while the clamp (Fig. 7*f*) is intended for the posterior surface of the anterior pillar. It is more convenient to have two sets of these clamps to fit the right and left sides of the throat. By inverting them, however, one set can be made to fit into the Sinus tonsillaris of either side. The clamps are left *in situ* for about half an hour, and if on removing them the hemorrhage begins anew, they are replaced and allowed to remain for two hours. These clamps are more effective than the Mikulicz model and cause the patient less discomfort. If they are used, it should never be necessary to sew the pillars together.

Comparison of the Anterior and Posterior Methods of Operating.

Were it not for the hemorrhage generally met with, it would be a matter of no consequence whether the dissection were begun at the anterior or the posterior edge of the tonsil. But owing to the bleeding, which is usually quite brisk, it is decidedly advantageous to begin the operation posteriorly for the following reasons:

If one follows the anterior method of Ballenger, towards the end of the operation the tonsil will be found attached to the posterior pillar (Fig. 5), and sometimes also in the region of the tongue. In cases of severe hemorrhage it is very difficult, if not quite impossible, to see the line of junction of the posterior pillar with the tonsil; as the effusion of blood may be so great as to leave the upper surface of the tonsil alone visible. In such cases to proceed further with the knife is dangerous; the operation has to be completed with a snare or ecraseur, and even then there is danger of snaring off part of the posterior pillar.

The posterior method has been found of particular value in the cases of profuse hemorrhage, as by this procedure it is always possible to complete the enucleation with only the knives. When the posterior method is used, towards the end of the operation the tonsil will be found attached only by a certain amount of loose tissue to the fascia covering the superior constrictor muscle of the pharnyx at some point (shown schematically by the shaded area in Fig. 6), near the middle of the Sinus tonsillaris. This remaining pedicle is easily severed with the blunt-ended knife, as described in Step IV of the operation, without any danger whatever of injury to the posterior pillar, no matter how great the hemorrhage may be.

In a word, the last step of the anterior operation consists in cutting the tonsil from the posterior pillar, and the region of the tongue, which owing to the abundant hemorrhage may be difficult to do accurately. Should the posterior pillar by mistake be removed, the resulting cicatricial tissue, by restricting the movement of the velum palatinum may give the patient a nasal voice. On the other hand, the final step in the posterior operation consists in severing the tonsil from its connection at a point somewhere near the middle of the Sinus tonsillaris, which is easily done regardless of the amount of hemorrhage, and with no danger whatever to the posterior pillar, that had been dissected free at the beginning of the operation.

It will thus be seen that the procedure here described possesses two distinctive features: (1) The dissection of the tonsil beginning at the posterior edge and proceeding anteriorly. (2) The control of the hemorrhage by specially constructed clamps.

Although it is certain that skilful operators will have good results by following any of the well-known procedures, we believe the method here described to be the safest, quickest, and least uncomfortable for the patient.

FIG. 1.—First step of operation. The dissection of the tonsil from the posterior pillar.

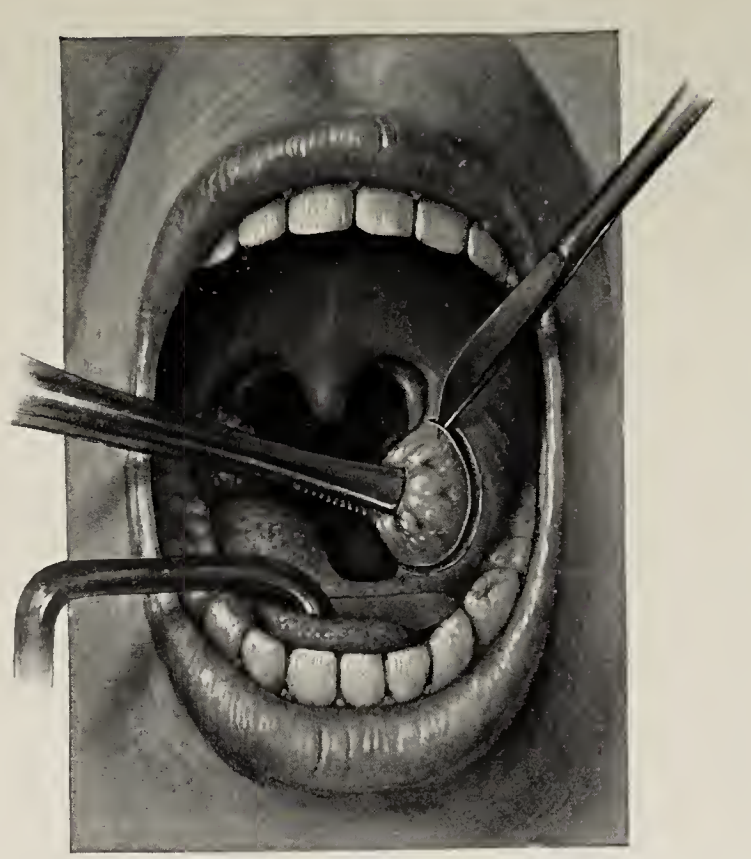

FIG. 2.—Second step of operation. A circular cut is made anteriorly around the tonsil through the mucous membrane thus permitting the tonsil to be drawn well out into the mouth.

FIG. 3.—Third step of operation. The loose tissue connecting the capsule of the tonsils to the fascia of the superior constrictor muscle is cut through the greater part of its extent from behind forwards and from above downwards.

FIG. 4.—Fourth step of operation. The capsule of the tonsil is severed from its remaining attachment to the fascia of the superior constrictor muscle, thus completing the enucleation. The position of the pedicle cut through is shown schematically by the shaded area in Fig. 6.

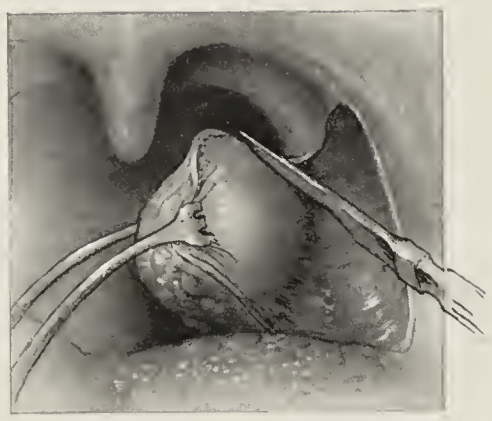

FIG. 5.—Ballenger's figure modified from his recent book showing the final step of his operation.

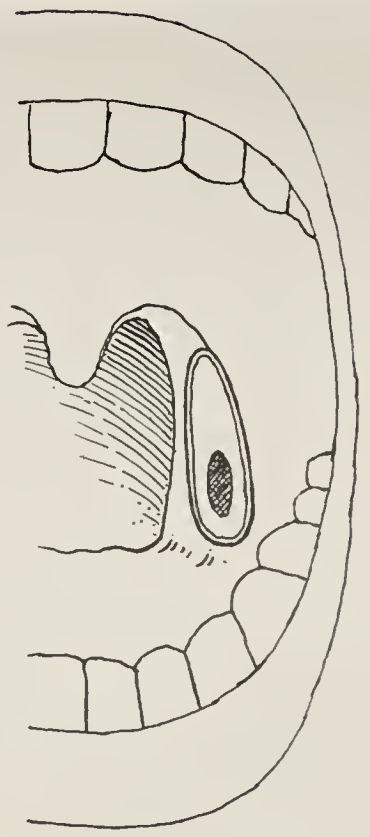

FIG. 6.—Showing schematically the position of the last bit of tissue connecting the capsule of the tonsil with the fascia of the superior constrictor muscle, which is severed in the fourth step of the operation as shown in Fig. 4.

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A SIMPLIFICATION OF DE GRANDMONT'S OPERATION FOR PTOSIS.[1]

By Samuel Theobald, M. D.,

Clinical Professor of Ophthalmology and Otology, Johns Hopkins University; Ophthalmic and Aural Surgeon to the Johns Hopkins Hospital.

Not long since there came under my care at the Johns Hopkins Hospital a case of acquired, bilateral ptosis, in which the lid fault—itself but one of many manifestations of a grave, general myasthenia—was decidedly more marked upon the left than upon the right side.

As there was little ground to hope for improvement from non-surgical measures, I operated upon the more affected, left, eye by the method of de Grandmont as modified by Gruening, and, with a view of obtaining as perfect a cosmetic result as possible, I decided to wait for a few days and see the effect of this first operation before proceeding with the second eye.

Meanwhile, I considered how I might correct most exactly this slighter defect of the right lid; and after some reflection it occurred to me that this could be accomplished best by everting the lid and, without any disturbance of the external integument, removing directly from the tarsal cartilage—the outlines of which would then be easily seen—a strip of such width as might seem to be indicated, the excision to include, of course, the overlying conjunctiva. This procedure, furthermore, commended itself as involving less traumatism, and as being altogether a simpler and more easily performed operation than that of de Grandmont.

After waiting three days, I proceeded to operate upon the right eye in accordance with the plan determined upon. The eye having been first anæsthetized by the instillation of a 10 per cent solution of cocaine, the upper lid was everted and a few drops of a 2 per cent solution of cocaine, to which had been added a small quantity of a 1:1000 suprarenalin solution, was injected into and, perhaps, beneath the cartilage at several points along the line of the proposed incisions. An incision, begun with the knife and completed with scissors, was then made through the conjunctiva and the whole length of the cartilage parallel with, and about $3\frac{1}{2}$ mm. from, the face border of the lid. In similar fashion, a second incision was made *parallel with the first* and about 3 mm. from it, and the included strip of cartilage and conjunctiva was excised. The edges of the divided cartilage were next brought accurately together by means of three fine, black silk sutures, and, in less than half the time required to execute the de Grandmont procedure upon the other eye, the operation was completed. Furthermore, when the lid was turned back into its normal position, one could see at a glance exactly to what extent the ptosis had been corrected, the elevation of the lid-margin being practically the same as was found a few days later when the œdema consequent upon the incision had disappeared. The anæsthesia induced was complete, and there was no complaint, whatever, of pain. Probably a weaker solution of cocaine would have been equally effective, but the house surgeon, who looked after this feature of the operation, did not care to take this chance. Snellen's lid-clamp might possibly have facilitated the making of the incision through the cartilage, but it did not occur to me to use it.

I have emphasized the point that the second incision through the cartilage was made *parallel with the first*. This, again, is a departure from the de Grandmont operation; and it seemed to me to possess an important advantage, in that both edges of the divided cartilage are straight—not one straight and the other concave as in his procedure—and therefore more apt to unite evenly and without distortion. Furthermore, it seemed that the removal of a broader strip from the middle of the cartilage could have only the effect of elevating disproportionately the center of the lid-margin. The result proved the correctness of this reasoning—the lid was raised squarely throughout its length.

It was feared that the stitches upon the conjunctival aspect of the lid—which, as a matter of precaution, were not removed until the fourth day—might cause the patient considerable annoyance, but this did not prove to be the case.

To summarize the advantages which the procedure I have outlined seems to possess, it may be said: That it is a simpler operation, involving considerably less traumatism, than that of de Grandmont, and consequently may be performed in half the time; that it does away with the buried stitches which he employs, or the deep ones, coming out on the lid-margin, suggested by Gruening; that the parallel incisions through the cartilage are preferable to those made by de Grandmont for the reasons just set forth; that one may judge at once exactly the effect produced in elevating the lid, and may with little trouble increase this effect, if it seems desirable to do so; and that the restoration of the parts to their normal condition occurs in much less time than in either the de Grandmont or Gruening operation.

The simplicity and advantages of the plan which had suggested itself of attacking the cartilage from the inner surface of the lid seemed so obvious that I could not but ask myself whether this method had not occurred to others. A perusal of de Grandmont's description of his operation[2] showed, at all events, that it had not been thought of by him. Turning next to the account of Bowman's operation,[3] which differs from de Grandmont's in that the upper lip of the cartilage, with a portion—in the case described "about half an inch"—of the tendon of the levator palpebræ, is removed. I was interested to learn that in his first case (the one just referred to) he

[1] A paper read before the American Ophthalmological Society, July 16, 1908.

[2] "J. de Méd. de Paris," 1891, p. 296.

[3] "Royal London Ophthalmic Hospital Reports," Vol. I, p. 34.

operated from the conjunctival surface of the lid, though in subsequent cases he went through the external integument; which is not surprising, as he doubtless found it easier to resect the levator tendon by this route.

Since this paper was written, I have received from the patient's physician, Dr. G. F. Bush, of Carnesville, Ga., a letter in reply to one which I wrote him asking for information as to the further progress of the case. Writing on July 13, the operation on the left eye having been performed May 22, and that on the right eye May 25, he says: "The operation on the left eye is not a success. The lid remains œdematous and heavy . . . . The weight seems to produce a dropping or ptosis. The right eye is all O. K. The result is excellent. You can not detect that it has been operated upon."

THREE CASES ILLUSTRATING THE RELATIONSHIP BETWEEN CERTAIN DISEASES OF THE BLOOD AND SARCOMA.

By F. G. Bushnell, M. D., D. P. H.,

Pathologist Stephen Ralli Memorial Pathological Department, Sussex County Hospital, Brighton, England.

Case I.—Leukanæmia (or atypical lymphocytic leukæmia with a leukæmic or pseudoleukæmic blood condition).

A. W., 20 years, male. Admitted to the Stephen Ralli Memorial Hospital, July 5, '07, under the care of Dr. E. Hobhouse, for "anæmia."

Previous Health.—Has never been laid up before; being always healthy.

Personal History.—Unmarried; is a laborer by occupation. For many years has taken two or three pints of beer daily, but never spirits.

Present Illness.—Commenced gradually about 10 weeks ago, with a feeling of sleepiness and weariness, making him unfit for work. These feelings have gradually increased and he took to bed five weeks ago. He has had no other complaint. He attributes the illness to extra work, three weeks previously he having worked eleven in place of eight hours a day.

On Admission.—Temperature 98.4°; pulse 112, dicrotic; respiration 28. He is very white and looks ill. Conjunctivæ and gums pale. Pupils widely dilated, equal and active. Breath short, and even speaking causes dyspnœa. No œdema; no clubbing of fingers; no enlarged glands.

Circulatory System.—Pulse 112, large, soft and dicrotic; regular. Heart apex-beat forcible in fourth space, just inside nipple (3½ inches from mid-line). Left border in left nipple-line. Right border one inch to right of mid-sternum. Upper border, third rib.

Sounds: "Bruit de diable" present. First sound followed by soft systolic murmur all over precordia with loud pulmonary second sound. Capillary pulsation present. The carotids and other vessels pulsate forcibly.

Respiratory System.—Healthy.

Abdomen.—Distended by enormous enlargement of liver.

Liver.—Upper border, fourth rib; lower border, anterior superior iliac spine. Surface smooth, firm and slightly tender; margin quite sharp.

Spleen.—Very large, filling up Traube's space; anterior border, sixth rib, upper margin; upper border, level of nipple; left border, two fingers' breadth below costal margin. No moveable dullness in abdomen. No other mass felt.

Urine.—Acid, 1017. No albumen, no sugar, no blood; heavy deposit of urates.

August 10, '07. After the removal of blood from the ear for examination there has been continuous oozing; slight oozing from gums; has had general aching all over for a few days.

August 13, '07. Epistaxis occurred.

August 17, '07. Legs and feet, especially left, slightly œdematous. Much pain in knees—sleeping badly.

August 28, '07. General condition better. Liver edge two inches below costal margin. Spleen not felt—œdema of feet almost gone.

September 8, '07. Slight epistaxis and bleeding from gums four days ago.

September 10, '07. Bleeding from ear after removal of blood. Slight oozing from gums. Not so well. P. 126; R. 28; no pain.

Post-Mortem Examination.

The autopsy was made October 11, '07, by Mr. A. W. Anderson, M. B. Body very pale, well nourished, soft. Rigor mortis barely present; post-mortem lividity absent.

Lungs.—Pleuræ normal; no fluid present.

Right Lung.—Two patches of consolidation the size of a large marble in upper lobe, œdematous.

Left Lung.—Very œdematous all over.

Heart.—Pericardium contained about six or eight ounces of clear serous fluid; no thickening of pericardium or inflammation. Heart very large, right ventricle dilated, much ante-mortem clot in both auricles. Numerous minute hæmorrhagic spots underneath pericardial and endocardial surfaces, well marked about auriculo-ventricular valves. Heart muscle flabby and shows "tabby cat" striations of fatty degeneration on endocardial surface most marked on papillary muscles. Valves showed no abnormality. Aorta healthy.

Liver.—Generally and enormously enlarged, weight 4750 grm. The cut surface showed some fatty and fibrous changes. A faint Prussian blue reaction was obtained irregularly, apparently about interstitial tissue.

Spleen weighed 1775 grm., surface dark red, substance firm. A spleniculus was attached to upper border of tail of pancreas.

Kidneys.—Left, 475 grm. weight; right, 250 grm. Both showed extensive fatty changes, cortex and pyramids being indistinguishable; surface pale without striation; capsules stripped easily.

Pancreas.—No abnormality.

Mesenteric Glands.—All somewhat enlarged, red and soft.

Bone Marrow.—Right femur very dark-red and firm.

Stomach.—No naked eye change.

Other organs not examined.

Bacteriological Examination.

Cultures made from marrow and spleen were sterile.

Morbid Histology.

Liver shows no iron reaction in sections. The capillaries are stuffed with large mononuclear cells. There are nucleated red cells (megaloblasts).

Marrow shows large mononuclear cells in great numbers, with myelocytes, eosinophil myelocytes, normoblasts, and megaloblasts, a differential count was not made. There are numerous mitoses, and fat is present in small amount.

Spleen.—The Malpighian bodies are inconspicuous and the pulp appears more uniform as a consequence, and resembles marrow. The cells are mainly large mononuclear cells. Some of these have very large pale nuclei, others have deeply staining irregular nuclei and show mitoses. There are a few eosinophil cells, small lymphocytes and erythrocytes.

Kidneys show inter-tubular deposits of large mononuclear cells with some lymphocytes.

Stomach shows its small vessels full of large mononuclear cells. There are mast cells in their neighborhood and in inter-tubular spaces of mucosa.

Lymph Glands.—The germ centers are composed of lymphocytes with some large mononuclear cells. The germ centers are inconspicuous in some areas. The medulla contains many large mononuclear cells with big pale, rounded, or again deeply staining irregular nuclei. Some cells are of great size. Numerous mitoses are present, especially in lymph sinuses suggesting endothelial proliferation. The lymph sinuses and also the capillaries are choked with large mononuclears, which have in places penetrated the capsule and passed into the perilymphatic fat.

Treatment.—The drugs used were arsenic and atoxyl.

Blood examination:

CASE I.—July 6, '07.

Red cells	2,922,800 per cmm.
White cells	7,200 per cmm.
Hæmoglobin	56-58%
Index	0.973

There are 21 per cent of polynuclears and 78 per cent of lymphocytes. Many of the lymphocytes are atypical, being large with much cytoplasm.

August 18, '07:

Red cells	1,888,000 per cmm.
White cells	3,200 per cmm.
Hæmoglobin	46%
Index	1.15
Polynuclears	46.0%
Eosinophiles	1.7%
Lymphocytes	46.7%
Transitionals	2.0%
Myelocytes	2.0%
Mast	0.9%

There were nine megaloblasts, thirteen normoblasts and four microblasts.

September 8, '07:

Red cells	3,360,000 per cmm.
White cells	4,000 per cmm.
Hæmoglobin	40.0%
Index	1.7
Polynuclears	35.8%
Small lymphocytes	60.0%
Large lymphocytes	3.7%
Transitionals	0.4%

Two megaloblasts, fifteen normoblasts and five microblasts.

September 18, '07:

Red cells	1,360.000 per cmm.
Leucocytes	6,900 per cmm.
Hæmoglobin	26.0%
Index	1.0%

There were 30.3 per cent polynuclears, 51.2 per cent small lymphocytes, 12.0 per cent large lymphocytes, 3.5 per cent transitionals, and 2 per cent myelocytes.

Remarks.—In 1906 I recorded a case of leukanæmia (myeloid splenic anæmia) at the Pathological Society of London. The patient was a male, aged 26 years, under the care of Dr. D. Hall, and had been jaundiced for years. There was great enlargement of the liver (59 oz., 1770 gr.) and spleen (42 oz., 1260 gr.). The blood had the features of pernicious anæmia as seen in a high index, low red cell count, and number of nucleated red cells; whereas the leucocytes were about normal in number but contained myelocytes and transitional cells in small numbers. The liver capillaries were stuffed with mononuclear cells, myelocytes, and nucleated red cells, and similar cells were found in the spleen.

Similar findings were made in the case now described, although lymphocytes in the blood and viscera were in excess of myelocytes. In both cases evidence of hæmolysis was absent.

Dr. Drysdale has collected and described 12 cases of this disease in the *Quarterly Journal of Medicine,* Vol. I, No. 1, October, 1907.

As to classification, Von Leube was led to place the disease under the name of leukanæmia on account of the combination of red and white blood cell changes found. Drysdale, on the other hand, considers that the blood picture of pernicious anæmia (which he believes to be always secondary or symptomatic) may be found in simple anæmia (post-hæmorrhagic) and in infections (bothriocephalus latus).

Drysdale, therefore, regards the anæmia in this disease as a severe secondary anæmia differing only in degree from the anæmia seen in ordinary leukæmia. Thus my cases would be regarded as atypical leukæmia, myeloid and lymphatic respectively, with a leukæmic or pseudo-leukæmic blood state. For my own part I attach more significance to the presence of nucleated red cells in these cases than does this observer. Thus, besides megalocytes there were 2200 megaloblasts and 370 normoblasts per emm. in Drysdale's case, and 14,000 megaloblasts in Hurter's. This is not seen in the anæmia of sarcomatous disease nor usually in lymphatic leukæmia. In myelocythæmia when there is little or no anæmia and the patient is rosy and even vigorous, the presence of numbers of normoblasts has been frequently observed and also of mieroblasts and megaloblasts. There is then no *necessary* connection between these cells and anæmia. Therefore leukæmia or lympho- or myelocythæmia is, strictly speaking, not a term sufficiently comprehensive. Moreover the anæmia in these cases is of the pernicious type while the leukæmia is *per se* minimal, so that the use of the term leukanæmia is descriptive.

CASE II.—Lymphatic leukæmia with malignant lymphomata.

A. V., aged 23 years; unmarried; domestic servant. Admitted under the care of Dr. E. Maynard, at the Sussex County Hospital, on September 11, '07, for "pleural effusion."

Past history of measles and anæmia, but none of phthisis.

Family history good.

Present History.—One month ago began to feel weak and to lose her appetite. She caught a chill, had a cough without expectoration, and hot flushes; she had no shivering attacks, no vomiting or diarrhœa; she had a feeling of "tightness" after food. On getting up in the morning her face, especially below the eyes, was very swollen. She passed urine without pain or

frequency. She went to a doctor a fortnight before admission because she was weak, but she had no pain in the chest; she gradually became short of breath, her cough was worse and she came to the hospital. She has had no headache or swelling of legs.

On Admission.—She was a pale, well-nourished woman, with with marked dyspnœa giving a history of two weeks' shortness of breath and cough, without pain.

Tongue was foul, with thick, white fur; teeth fair; breath offensive.

Chest.—Cardia, apex beat in fifth space two and one-half inches outside nipple line; left border, two and one-half inches outside nipple line; upper border, fourth rib; right border cannot be defined, owing to dullness of right chest; sounds clear, no murmur. Pulse 140, volume fair, tension normal; respiration 38.

Right Lung.—Percussion dull front and back; as high as clavicle in front and spine of scapula behind. Above spine note is hyperresonant. Vocal fremitus absent; vocal resonance diminished. Breath sounds very weak and scarcely heard over lower five inches.

Left Lung.—Resonant all over, no adventitious sounds heard.

Abdomen.—Liver: upper border cannot be delineated; left border, at costal margin, edge not felt; spleen, not felt.

Nervous System.—No abnormality.

September 12, '07. Right chest aspirated and 42 oz. of yellow serum were removed. Patient was then comfortable and of good color, but one hour after aspiration she became cyanosed and her dyspnœa increased. Ether and ammonia relieved her, and she brought up some frothy expectoration.

September 14, '07. Right lung gave a resonant note to the sixth rib in front. Breath sounds well heard, high pitched. Note behind resonant except for a hand's breadth at base which is dull. Over this area vocal fremitus was absent and vocal resonance diminished. Above this breath sounds were well heard, high pitched; there were numerous "bubbling" râles with inspiration in front, side, and back of chest. Breathing comfortable, slight expectoration, good color.

Blood Examination (see chart).

September 21, '07. 72 oz. clear yellow fluid removed from right chest, followed by collapse, which improved next day. X-rays applied to spleen five minutes daily.

September 27, '07. 76 oz. drawn off right chest.

October 9, '07. 32 oz. removed from right chest; this contained no tubercle bacilli, but excess of lymphocytes. The sputum was free from tubercle bacilli.

October 19, '07. Spleen: Lower edge level of anterior superior spine. Liver one and one-half inches below costal margin, very tender, smooth.

October 31, '07. X-rays applied to spleen for five minutes daily; smaller.

November 5, '07. Glands larger generally, not tender. The temperature varied from 97° to 103°, usually rising to 100° or 101° daily.

Post-Mortem Examination.

December 10, '07. Made by Mr. Wootton, H. P. (It was made outside the Sussex County Hospital and a brief report only was obtained.)

Body pale, but no loss of fat.

The liver is enlarged, fatty, but there is no new growth seen (weight three pounds, four ounces).

The kidneys show no abnormality (weight four and one-half ounces each).

The spleen is very large, firm, and no deposit growths are seen (weight two pounds).

The lungs show no new growth about the bronchi or elsewhere, but there is bloody pleural effusion.

The lymph glands are generally enlarged, both the superficial and deep; those above right clavicle are especially increased in size and also those in the right axilla and around the pancreas and spleen, where they are very dark in color. The mediastinal glands are the size of a cocoanut and appear to be malignant.

The ovaries and uterus appear normal.

The alimentary tube shows no affection of the lymphoid follicles of the walls or mucous membrane.

There were no hæmorrhages other than those into the lymphatic glands.

Microscopical Examination.

Liver (Lab. No. 2740).—The perilobular zones, the hepatic capillaries, and the capsule of Glisson show lymphocytes in numbers.

Marrow of ribs and sternum shows marked excess of lymphocytes with many nucleated red cells.

Cervical glands show lymphocytes in a reticulum with many foci of large round cells ("germ centers"). Lymphocytes are aggregated in the sinuses and capsular lymphatics. There are large areas of necrosis. The capsule is thickened and invaded by lymphocytes. Within the capsule of the gland which is probably not the normal gland capsule are "germ centers" evidently the site of new gland tissues.

There are many large cells with large pale staining nuclei whose cytoplasm is basophilic and not quite clear, which are of endothelial nature—some may be called giant cells.

Mediastinal glands show same characters as cervical, with higher development of the stroma. The lymph sinuses are choked with lymphocytes; and the lymphocytes are invading the capsule and the adjacent muscular tissue.

Peripancreatic glands like cervical. There are giant cells with single nuclei and hæmorrhages into the glands are present.

Ovaries show numerous round cells in stroma and in vessels, and around corpora albicantia and lutea.

Kidneys contain some foci of round cells.

Suprarenals.—Capillaries are stuffed with lymphocytes and there are masses in connective tissue of capsule.

Spleen is congested. Its vessels, capsule and framework are hyaline. There are many lymphocytes in sinuses.

Pancreas shows auto-digestion.

Blood examination:

Case II.—October 18, '07:

Red cells	4,056,000 per cmm.
White cells	222,200 per cmm.
Hæmoglobin	80.0%
Index	1.0%

Leucocytes:

Polynuclears	8.4%	18,664 per cmm.
Eosinophiles	0.5%	1,111 "
Small lymphocytes	65.1%	144,430 "
Large lymphocytes	17.4%	38,662 "
Transitionals	1.4%	3,110 "
Myelocytes	7.0%	15,554 "
Eosinophilic myelocytes	0.6%	1,332 "

Three monoblasts; megalo-, micro-, and poikilo-cytes present.

October 24, '07:

Red cells	3,328,000 per cmm.
White cells	124,000 per cmm.
Hæmoglobin	70.0%
Index	1.0%

Leucocytes:

Polynuclears	10.6%
Eosinophiles	0.7%
Small lymphocytes	50.6%
Large lymphocytes	26.7%
Transitionals	1.0%
Myelocytes	9.4%
Mast	0.3%

November 5, '07:

Red cells	3,350,000 per cmm.
Hæmoglobin	64.0%
Index	0.86%

November 14, '07:

Red cells	2,138,000 per cmm.
White cells	66,138 per cmm.
Hæmoglobin	50.0%
Index	1.1%
Polynuclears	8.4%
Small lymphocytes	85.0%
Large lymphocytes	3.6%
Myelocytes	3.6%

Remarks.—It is clear that there exists in this case a generalized disease of the lymphatic glandular system together with a leukæmic (lymphocytic) condition of the blood, liver, kidneys, spleen and bone marrow.

The question arises, of what nature was the glandular enlargement which I have labelled malignant lymphomata, and what is its relation to the blood condition (if any)?

As bearing on the character of the glandular enlargement, one may recall the following facts:

(1) The enlargement of the glands in leukæmia is usually within the limits of their capsules and contiguous glands do not fuse. Histologically the enlarged glands present a more or less normal appearance, the chief difference being the great increase in quantity of the germ center material which may equal or exceed in quantity that of the normal medullary substance. The reticular structures remain normal.

(2) Gibbons records 9 cases of Hodgkin's disease (lymphadenoma) with 5 autopsies in which the blood picture was normal and there was no relative change in leucocytes. The glands showed proliferation of the germ centers of follicles and of the endothelium of the sinuses, and the presence of giant cells, eosinophiles, a few plasma cells and polymorphonuclears. Gibbons also describes infiltration and penetration of the gland capsules with invasion or destruction of the adjacent muscle or other tissue. Metastases were present in the liver and spleen in 4 each, in the kidney in 2, in the lungs, pericardium and pancreas in one each. The metastases resembled gland tissue sharply defined but without a capsule and showed malignant invasive characters.

(3) Lymphosarcoma according to Kundrat, quoted by Salaman (*Trans. Path. Soc.,* Lond., 1904, "Sarcoma of Stomach") is an entity with the following characters. It is composed of lymphoid cells in a fibrillary meshwork and either cells or meshwork may be in excess, giving rise to medullary or fibroid forms.

It infiltrates "without restraint," thus differing from leukæmic and pseudo-leukæmic growths. Presumably this means that its infiltrating powers are more developed and destructive.

It chooses the readiest paths for propagation, does not show degenerative changes common to leukæmic and pseudo-leukæmic growths and its secondary deposits are not true metastases. It possesses other negative characters. It commonly begins in the glands of the neck or axilla.

(4) True sarcoma of the lymph glands presents the usual features of this growth elsewhere.

It will be seen that the glandular enlargement presents at once characters described in leukæmia, lymphosarcoma and, even in lymphadenoma.

Thus in some regions the enlargement of the lymph glands had not transgressed their capsular boundaries and there was a marked increase in germ center material with degenerative changes. In addition there was the blood and visceral condition which presented a typical leukæmic picture.

Again, in the mediastinum the growth presented certain of the characters of a lymphosarcoma in large areas and had fused into a large mass.

Lastly, the infiltration of the gland capsules and invasion of adjacent tissues is described in lymphadenoma, by Gibbons. In this disease, which is one of youth and early middle age, the commencement is usually in a gland or group of glands which gradually or rapidly enlarge.

Similarly Salaman had seen a case of lymphatic leukæmia where the glands had fused and formed a solid mediastinal mass which seemed to possess most of the malignant properties of lymphosarcoma. Also a lymphadenoma of the glands of the neck which gave rise to a large mediastinal tumor which had all the appearance of a lymphosarcoma and had invaded the pericardium and tissues at the base of the heart.

The relationship which I suppose to exist between the glandular disease and leukæmic blood condition I will give after the description of Case III.

CASE III.—Large round cell sarcoma of cervical glands of neck with changes in the leucocytes.

J. W. I., aged 39 years. Admitted under the care of Mr. Verrall, on November 21, '07, for swelling of the neck.

SUMMARY OF CLINICAL CONDITION.

There is a swelling of the lymph glands on the left side of the neck which started as a small lump nine weeks previous to admission. It gave rise to no inconvenience until two weeks before admission, when it began to be painful at night. There was no discomfort in eating or affection of the movements of jaws. There was "nagging" pain in left shoulder, arm and side of head.

An abscess, supposed to be septic, was opened at Guys Hospital, in 1905.

There was a large diffuse brawny swelling on the left side of the neck. There was no sign of metastases, no hæmorrhages. Microscopical examination of a small portion removed for diagnosis showed it to be due to a large round cell sarcoma of the lymph glands undergoing necrosis.

Trypsin and amylopsin were administered without obvious effect.

Blood Examination, December 14, '07:

Erythrocytes	5,500,000 per cmm.
Leucocytes	13,400 per cmm.
Hæmoglobin	108%

Leucocytes:

Polynuclears	69.0%
Eosinophiles	3.0%
Small lymphocytes	18.7%
Large lymphocytes	2.1%
Transitional cells	6.4%
Mast cells	0.4%

The blood shows 6.4 per cent of *transitional* cells. These were three or four times the size of red blood cells. The nuclei were rounded, but indented, and without granulations; or deeply indented and with slight, fine granulations.

Remarks.—The transitional cell is regarded as a large mononuclear in which the protoplasm has developed a fine scanty neutrophil granulation, the staining of the nucleus has improved, and the shape changed to a horse-shoe or hour-glass form.

This cell is rare in normal blood and difficult to recognize (Buckmaster). It is supposed that in the blood and elsewhere the large mononuclear cells change by becoming granular into transitionals and these again into the polymorphonuclear cells. There is no positive evidence of this, however, but Buckmaster has seen both large mononuclear cells and cells indistinguishable from transitionals in lymphoid tissue. There are appearances in the sections of this sarcoma which suggest this to be the case here. The granulation of the cell is thought to be a feature of the age of the cell.

Although Ehrlich considers that large mononuclear cells have no relationship with lymphocytes, it is thought by some that they are members of the lymphocyte series, and in this I agree.

Ehrlich considers that large mononuclear cells do not arise in the lymph glands, but Buckmaster has seen them in lymphatic glands and possibly they are macrophages. Possibly the bone marrow (Ehrlich), lymphatic glands (Gulland), and spleen (Turk) each contribute a small supply to the blood.

Summary.—(1) These cases afford evidence that the glandular enlargements and visceral deposits of leukæmia are closely allied to lymphosarcoma and that pseudo-leukæmia and lymphadenoma possess the characters of malignant growths.

(2) In leukæmia the lymphocytes may be regarded as elements of malignant character.

(3) In sarcomatosis, and sarcoma of the lymph glands changes may occur in the leucocytes (in the presence of transitional cells).

(4) No absolute distinction can be drawn between leukæmia and sarcoma.

THE TEACHING OF PHYSIOLOGICAL PATHOLOGY AT THE UNIVERSITY OF MICHIGAN.

By F. Peyton Rous, M. D.,
Instructor in Pathology, the University of Michigan.

During the last two years there has been offered to junior students at the University of Michigan an elective course in physiological pathology. For some time previous—indeed, since 1895—Dr. Warthin had taken up in the Journal Club themes in experimental pathology. This work he will himself report later.

The present course in physiological pathology extends over three hours a day during three weeks, and it is given twice in the year. No attempt has been made to take up the whole subject, but teaching has concerned itself mostly with those disturbances of circulation and respiration important clinically. No text-book is followed. Experiments and conferences on the topics illustrated by them have made up the major part of the work, but museum specimens have been shown when needed to bring out special points. Where possible the operative work has been accomplished previous to the meeting of the class, by the help of some of its members.

The course presented last autumn had the following arrangement:

I. Vascular Disturbances.

Anæmia, congestion, stasis, hæmorrhage, clotting, and embolism were studied in the mesentery of the frog. By ligation of the veins of the tongue the characteristic passive congestion described by Cohnheim was obtained. The capillaries and small veins became solidly packed with cells; they showed "mulberry protuberances" from which diapedesis took place; and in the arteries a pronounced *va-et-vient* rhythm became evident.

Ligation of the large blood-vessels in the dog showed the relative effects of occlusion of the femorals, the carotids, the cœliac axis and the portal vein. Ligature of the vessel last named brought the animal to a condition of intense dyspnœa and low arterial blood-pressure, from which it speedily recovered when the ligature was removed. In a dog suffering from shock some of the larger arteries were ligated to help recovery, thus following out the principle of a tight bandaging of the extremities, and of Crile's rubber suit.

The results on blood-pressure of handling the intestines, of repeated small hæmorrhage, and of one brisk hæmorrhage, were now tried. When loss of blood had brought its characteristic symptoms an infusion of salt solution into a vein was practiced. After the recovery of the animal this infusion was not discontinued but a bulk of fluid three times that of the animal's original content of blood was allowed to enter

the circulation—thus repeating the experiment of Cohnheim, and Lichtheim, and of Magnus. This caused marked dyspnœa which was not fatal. The arterial blood-pressure, once the animal had recovered from the effects of the hæmorrhage, was not altered by the additions of fluid. The pathological findings at autopsy after this procedure formed a good basis whereon to found a discussion of the causation of œdema. No anasarca, hydrothorax, or ascites was present, but only the well-known œdema of the stomach, gall-bladder, and especially of the pancreas, which was as though set in jelly. The effects of the infusion when the animal had been subjected to laparotomy and the intestines and mesentery had been handled gave an interesting side-light. In two such instances ascites developed. It was also noted that as infusion progressed the abdominal wound bled anew, oozing throughout its length. This observation has a direct bearing on the question of infusion after hæmorrhage.

Other results of vascular disturbance and of changes in the chemical constitution of the blood were shown by the effect on urinary secretion of ligation of a renal vein, of cutting one kidney out of the circulation, of contracting the vascular bed in the kidneys while raising the general arterial blood-pressure (adrenalin), of hydræmic plethora, and of increased sugar in the blood.

The demonstration of air and fat embolism will be mentioned farther on. An attempted observation of retrograde metastasis did not lend itself to a satisfactory graphic demonstration.

In all of these instances records were taken of blood-pressure in a common carotid artery and in an external jugular vein.

II. Cardiac Disturbances.

It was found possible to show in one afternoon and on one animal the effects of several lesions. Thus, pericarditis with effusion was simulated by introduction of oil into the pericardium, then an aortic stenosis was produced, and later a mitral insufficiency. Recent literature makes unnecessary a description of the means used to obtain these lesions. Tracings were taken from an auricle, a jugular vein, a carotid, and in the case of pericarditis of the intrapericardial pressure to demonstrate how small this may be while seriously interfering with the circulation.

Lesions of all of the heart-valves except the pulmonary were produced or simulated, though not all of these before the same class. In one instance the compensation in a case of mitral insufficiency was varied at will by the production of aortic stenosis. It was interesting to note the immediate rise of pressure within the left auricle and the greatly increased systolic pulsations which resulted from a very slight stenosis. In two cases of tricuspid insufficiency compensation was broken by the injection into a jugular vein of a little oil and a little air respectively. The air and fat embolism were slight, yet sufficient to overturn the balance of affairs.

A study of tricuspid insufficiency proved especially useful. It helped to demonstrate that, mechanically considered, the farther back in the heart-pump a lesion is, the more poorly it is compensated; and it brought out the influence of the time-element in heart-disease, for the venous stasis and pulsation, so characteristic clinically, do not at once follow tricuspid insufficiency abruptly produced in a dog. In one instance out of four, a systolic jugular pulsation slowly made its appearance during the minutes of observation.

While the class worked on these lesions its attention was incidentally directed to changes in the heart sounds. The thrill and murmur, perceived most strikingly at the left auricle, as a result of mitral insufficiency, demonstrated with a conclusiveness impossible in clinical teaching that the point on the chest wall at which we most easily feel a thrill or hear a murmur may correspond but ill with the cardiac region where these are most intense, and that such a point is valuable clinically only because it is on the line along which these signs are transmitted.

The damage wrought by a myocarditis was simulated in the usual manner by injection of a fixative into the musculature. In one instance these injections were confined to the left ventricle to note whether an acute pulmonary œdema would ensue, but the complication did not occur. An observation such as this, or such as the production of fat or air embolism, coronary occlusion, hæmorrhage, or asphyxia, was generally made upon an animal which had been used in a demonstration of a lesion not of itself fatal. The differences in mode of death between that consequent on sudden stand-still of the heart after coronary occlusion, on failure of the circulation after air embolism, despite violent cardiac contractions, on acute asphyxia, with its transiently heightened blood-pressure and persisting heart-beat, were brought out. In the right ventricle after air embolism the remarkable stiff, red foam was met with.

III. Disturbances of Respiration.

The effect on breathing of paralysis of the abdominal muscles of respiration and of the costal ones, respectively, was first observed. To simulate the paralysis a bandage strapped about the abdomen or chest was used—a poor measure, since, of course, it was impossible to avoid some effects from direct compression. The changes in breathing were recorded, as in the later experiments, by means of an air-transmission tambour connected directly with the trachea.

An acute dilatation of the stomach by its inflation with air (Kelling), through a canula tied into the œsophagus, resulted in a rise in intrathoracic pressure, marked dyspnœa, and a gradual fall in blood-pressure. The distention was relieved by puncture in the left hypochondrium. The immediate death of the animal by almost simultaneous cessation of heart-beat and respiration took place. Another interesting death occurred through acute pulmonary œdema, which came on during the production of an artificial hydrothorax. The lung had not been pierced.

By filling the peritoneal cavity rapidly with salt solution an ascites was simulated and its results in dyspnœa and changes

in blood-pressure were followed. Attention was drawn to the prominent physical signs of this lesion, as to those of the gastric distention, but they were not studied.

The mechanical conditions of a tracheal stenosis were produced at will by pressure on a large rubber tube united end to end with the trachea. During a stenosis, in both phases of respiration, the characteristic long-drawn breathing with active expiration was noted. Inspiratory stenosis gave a lengthening of the corresponding phase of respiration with a fall in the intrathoracic pressure, permanent with the duration of the lesion; expiratory stenosis gave opposite results. In all three cases the blood-pressure rose. By means of a bulbous sound the right primary bronchus was occluded. The records showed that this did not cause a change of the respiratory rhythm, or of the carotid blood-pressure. These phenomena were made the theme of a talk on the disturbances of respiratory rhythm and of intrathoracic pressure seen clinically.

The last demonstration dealt with the effects of increased intracranial pressure on blood-pressure and on respiration. It was easy to show that the general effects of increased intra- and extradural pressure are the same. Tracings were obtained of the rise of blood-pressure and slower heart-beat, of the pronounced slowing and final disappearance of respiratory movements.

Most of the experiments described were performed within a single course of three weeks, since, as has been indicated, one animal often sufficing for several of them. With the exception of the cardiac insufficiencies they were found useful for class purposes. In the production of the insufficiencies a lesion that brings the heart rapidly to a stop frequently cannot be avoided. Altogether, out of some fifty attempts at various demonstrations, six have been failures.

The value of the work in its present limited scope must be measured less by the amount of ground covered than by the point of view given the student for his study of disease at the bedside. Then he will not be able to "open the back of the clock," as in these lesions of animals. But that an experience with these lesions will render more concrete to him the problems in human pathological physiology, and will directly aid him in the solution of some of them, cannot be doubted. At present one must be satisfied with this as the principal result of a short course in pathological physiology. If the subject becomes fixed in the recognized medical curriculum it will be possible to teach with more system those deviations from the normal physiology with which the doctor should be acquainted.

THE TONSILLAR RING AND THE PARANASAL SINUSES AS PORTALS OF ENTRY OF INFECTIOUS DISEASES.[1]

By Sylvan Rosenheim, M. D., Baltimore.

The term "tonsillar ring" includes the faucial, lingual, and pharyngeal tonsils as well as numerous isolated and combined lymphoid follicles found in the oral-, naso-, and laryngo-pharynx.

The various views regarding the functions of the tonsils can be conveniently divided into two groups: first, the theories advanced before Stöhr's discovery of the emigration of the lymphocytes from the interior to the periphery of the tonsils; and second, those advanced after the discovery.

The earlier writers, mostly anatomists, considered the tonsils as functionless filling-in organs, supporting Kolliker's view.

Morell Mackenzie in his work mentions a theory very commonly held, of the relationship of the sexual organs to the tonsils, based on their hypertrophy, which is seen often at the age of puberty.

Some clinicians have considered the tonsils of importance in the digestive functions. Bosworth thought that they acted mechanically in moistening the bolus of food. Rossbach believed they produced a saccharine ferment. Fox had the idea that the faucial tonsils absorbed superfluous salivary secretion and Spicer assumed that the pharyngeal tonsils acted in a similar way for the tears and nasal secretion.

That the tonsils are blood-forming organs has been suggested from time to time. The discovery of the germinal centers, *i. e.*, places in the follicles in which active karyokinesis and cell division is taking place, first gave rise to this view. To substantiate it, experimenters have determined a decrease in the number of lymphocytes in the circulation after extirpation of the tonsils. Pluder has described a constant emigration of newly-formed cells into the efferent lymph channels but Goerke has pointed out how impossible it is to demonstrate this. He says (1907) that the tonsils as a part of the lymphatic apparatus may share in the blood-forming work but by no means play an important rôle. In a recent work (1904) Wood gives his revolutionary conclusions in regard to the functions of the tonsils. He considers them the principal leucocyte formers. They give rise to the lymphocytes, which in turn are transformed into the various other forms of leucocytes. They arise, he says, not from the germinal centers but directly from the tonsillar crypts.

It has been thought that the tonsils, like the adrenals and thyroid, might produce an internal secretion. The experiments along this line have given contradictory results. Masini injected an extract of tonsils into various animals and noted a rise of the blood pressure, whereas Scheirer, performing similar experiments, noted a fall.

In 1884 Stöhr described a phenomenon that occurs constantly in the tonsillar tissue, namely, a wandering of the

[1] Paper read at the Southern Section of the American Laryngological, Rhinological, and Otological Society in Baltimore, December, 1907.

lymphocytes from the interior of the tonsils to the periphery. They force themselves or are forced between the epithelial cells, injuring them and destroying their function. The open spaces thus made between the epithelial cells led Gerhard to consider the tonsils as physiological wounds. Some writers believe that the tonsils are rendered much more vulnerable by this action of the leucocytes, to deleterious substances and micro-organisms which might readily penetrate the tonsils, whereas others draw attention to the fact that the constant streaming out of the leucocytes might act as a protective agency. The two opposing views have been termed the protective and the infective theories.

To determine whether foreign bodies and micro-organisms penetrate the tonsils, Hodenpyl, Goodale, Hendelsohn, Lexer, Goerke and others have performed numerous experiments. Hodenpyl (1891) smeared human tonsils with olive oil and lard, and applied for from fifteen minutes to one-half hour, carmine and Berlin blue in a similar manner in dogs. He also used solutions of anilin colors and atropin. He concluded from his experiments that the tonsils absorbed neither fluid nor solids under ordinary circumstances. He thought that the rarefaction of the tonsillar epithelium explained the entrance of the toxin of diptheria into the general circulation.

Goodale (1898) and Hendelsohn (1899) arrived at different conclusions from their experiments. Goodale's experiments were performed on the human hypertrophied tonsils and seem most convincing. He injected aqueous carmine solution into the tonsillar crypts and then excised the tonsils at intervals of from twenty minutes to two hours. In two control cases he excised the tonsils immediately after injection and found no absorbtion of the coloring matter. In all the others he found that carmine particles had been absorbed and that the depth at which they were discovered varied directly with the interval of time which had elapsed since the injection. Hendelsohn arrived at similar results after simply blowing colored particles over the tonsils.

Goerke (1907) claims to have arrived at negative results in repeating these experiments and ascribes the positive results to two factors: first, to the mechanical force used in the experiments and secondly, to a reversal of the lymph stream due to the amount of powder employed. He thinks that bacteria penetrate more readily the mucous membrane of the pharynx. He mentions some experiments of Lexer in which virulent bacterial cultures were painted over the throats of animals and very few were found to penetrate the tonsils. He considers the lymphoid tissue of the throat to be the portal of entry. He mentions some cases reported by Menzer of acute articular rheumatism following angina in which bacteria were found deep in the pharyngeal mucuous membrane, and but few and these only superficially in the tonsils. He thinks the tonsils owe their protective function not only to the mechanical influence of the constant stream of leucocytes towards the surface but to two other factors, namely, the bactericidal action of the lymph, and that of the products set free by the breaking down of the lymphocytes. That infections occur through the tonsils, Goerke doesn't deny; that they do not occur more frequently is due to the protective function of these organs. He says the tonsils reach their greatest development in childhood, when their need is greatest, as the infectious diseases are then most common, and that they retrograde after this age.

Whatever may be the true function or functions of the tonsils, I am inclined to agree from my studies and the results of a careful reading of the literature, with Bosworth, that normal tonsils should not be seen. Goodale's experiments were done on hypertrophied tonsils and certainly showed that such diseased tonsils absorbed foreign materials. The evidenee as collected from the literature is also overwhelmingly in favor of this view. As we shall see, many of the tonsils in severe septic infections appeared normal on the surface, whereas below the surface an entirely different picture was seen. It would not answer, however, to restrict the term diseased tonsils to those which project beyond the faucial pillars, as some of the most badly diseased tonsils are those which are hidden. The history of repeated attaeks of sore throat sometimes attraets attention to them, or their morbid condition is discovered in searching for a focus of a so-called cryptogenic infection. I think that everyone is agreed that any pharyngeal lymphoid tissue that is seen should be removed. This tissue is subject to all the diseases that affect the faucial tonsils, and is probably much more frequently inflamed than is supposed, as owing to its position the inflammation is overlooked.

As acute or chronic arthritis was a common sequel to the cases of tonsillitis seen by me, I shall review briefly the literature of the other infectious diseases associated with diseases of the tonsils, before discussing the rheumatic cases.

Aneurysm.—Libman reports a case of mycotic aneurysm, which he ascribed to a tonsillitis which occurred three weeks previous to its occurence. Death resulted after operation and at autopsy streptococci and staphylococci were grown from the aneurysmal sac.

Appendicitis.—Cases have been described by Apolant and Kretz.

Erysipelas.—According to Gerhard focal erysipelas frequently has its origin in the naso-pharynx.

Meningitis.—Perigord narrates the history of a case of fatal meningitis, in which at autopsy an abscess was found in the pharyngeal tonsil.

Iritis.—A case in which this complication occurred is recorded by Dock.

Pleuritis and *Pericarditis.*—Numerous cases have been reported by Hanot, Heddaeus, Dock, Jessen, Richardieu, Lermoyez, Metzner and others. In a case of Hanot, streptococci were found in both the tonsillar and pleural exudates. In Metzner's case the tonsils at autopsy showed collections of pus in the interior with an intact surface. Staphylococci and streptococci were found here, as in the pus from the mediastinum, pleural cavity and endocardium.

Pneumonia.—In a young girl seen by Jessen, an angina was followed in twelve days by pneumonia, pericarditis and nephritis. Streptococci were found in the tonsils. A blood culture was negative.

Paraplegia and *strasbismus* have been observed to follow tonsillitis by Emil Mayer and *parotitis* by Rosenberg.

Nephritis.—Leyden, Jeppe, Morse and others have laid stress on this complication of tonsillitis. Leyden and Morse call atten-

tion to the fact that some of these cases may develop into the chronic forms of nephritis.

Osteomyelitis.—Kraske and Mayer have recorded cases.

Phlegmon of the lower extremities following follicular tonsillitis has been reported by Trumbull.

Oophoritis and *Orchitis.*—Joal reports six cases of this complication.

Septic Infection.—Fraenkel, Heubner and Bahrdt, Jessen, and Babes relate some interesting histories. Fraenkel describes a case of retro-pharyngeal phlegmon, which began in the tonsil, followed by purulent pericarditis and pleurisy. Micrococci were found in the exudate on the tonsils and elsewhere. In another case of membranous disease of the pharynx and larynx, ulcerative endocarditis followed. Diplococci and streptococci were found. Heubner and Bahrdt saw a case of fatal scarlatina and acute articular rheumatism following membranous tonsillitis. The autopsy demonstrated a purulent exudate in the tonsil which had penetrated the capsule causing an infectious thrombo-phlebitis of the common jugular vein. Cocci in chains were found in the exudate on the tonsils, in the joints, blood, etc. Jessen reports two interesting cases. In one a woman was brought into the hospital comatose. There were hemorrhages into the skin. Albumin and casts were found in the urine. The tonsils and mouth were normal. Death occurred in twelve hours. Autopsy revealed abscesses in the interior of the tonsil on section, the outer surface appearing normal. The spleen was large and soft. Numerous abscesses and hemorrhages were found in the kidneys. In the second case the disease began as a follicular tonsillitis which was followed by double pneumonia, pericarditis and sepsis. On sectioning the tonsils abscesses were found, the surface being intact. Staphylococci were found in the organs.

Skin Manifestations.—Erythema, erythema nodosum, purpura, and erythema exudativum multiforme have been described by Jessen, Stephanides, Joal, Finger, and others. In a case seen by Jessen, erythema nodosum and pains in the joints followed three days after the onset of an acute follicular tonsillitis. Streptococci and staphylococci were found in the tonsillar exudate in pure culture. A blood culture was negative. In the case of a woman subject to attacks of purpura and polyarthritis seen by Stephanides, removal of the tonsils was followed by recovery. Finger found streptococci in the skin of a patient with erythema exudativum multiforme.

Typhoid beginning with an angina has been noted five times by Capalarri.

Tuberculosis.—The frequency of tuberculosis of the tonsillar ring is now so generally recognized that it is rare to come across an author like R. C. Brown, who declares this to be infrequent, and thus argues in favor of the protective function of the tonsils. Mayer originally expressed the idea in a vague way that enlargement of the lymphoid tissues in the throat might in some way be related to scrofula. Lartigau and Nicoll in an article written in 1904 have given an extensive review of the subject, together with the result of their examinations of seventy-five pharyngeal tonsils. Parts of each tonsil were used for inoculation experiments, the rest were examined histologically. They found that 16% were tuberculous and 10% showed histological lesions of tuberculosis. The lesions are usually close to the surface and focal in character. They considered that the tonsils might be portals of entry for tuberculosis. From a careful histological examination of sixty-four adenoids Uffendorfe found that 4-5% were tuberculous. Two of the patients gave no tuberculin reaction after the removal of the adenoids; one patient who, however, had pulmonary tuberculosis, reacted to tuberculin, after extirpation of the adenoids. The author concluded from his studies that the lesions were purely focal. Moritz Schmidt says it is remarkable how infrequent tuberculosis of the tonsils is when it is seen so often post mortem (Strassman 8%, Dmochowsky 39%, Schlenker 8%). However, the later researches, as those of Lartigau and Nicoll, have shown a high percentage of tuberculosis in adenoids removed during life. Often numerous specimens have to be examined before this is demonstrated. The *B. tuberculosis* penetrates the tonsillar epithelium in the lower animals without leaving any traces (Theobald Smith) and there is no reason why the same should not occur similarly in human diseased tonsils. In a number of cases of cervical adenitis in which the tonsils on removal were carefully examined, both histologically and by inoculation of animals, Goodale found a large number to be tuberculous. The prompt clearing up of the glandular condition in these cases demonstrated the primary nature of the lesion in the tonsils.

The literature showing the relationship between the various forms of rheumatism and tonsillitis is very extensive. The connection between acute articular rheumatism and angina has been noted for a long while. Heberden in 1804 described an angina which terminated in acute articular rheumatism and Trousseau in 1865 revived this idea. Friedrich points out that it was one of the first diseases in which the tonsils were recognized as a portal of entry for infectious diseases. The importance of angina as an etiological factor was also early pointed out by Lagranière, Boeck, Loebl, Mantle, Lennox Brown, Fowler, Cheadle, and others. The literature of the subject is completely covered in the articles of Buss, Suchannek, Bloch, and Peltersohn.

St. Clair Thompson says that 30% of the cases of acute articular rheumatism are preceded by angina. According to Ingals 13-29% of cases of acute articular rheumatism and tonsillitis have an identical cause.

Stoeffel, Stephanides, and Gurich have reported cases of cures of the arthritis following proper treatment of the tonsils and the latter makes this a point in favor of the tonsil being the portal of entry.

A great variety of organisms, staphylococci, streptococci, pneumococci, etc. have been found in angina. Likewise various organisms have been found in acute articular rheumatism. Poynton and Paine in eight cases found a diplococcus which they demonstrated in the tonsils, the pericardium, the heart valves, and the rheumatic nodule. They review the literature and state that the following organisms have been obtained: staphylococci and streptococci, diplococci and anærobic bacilli resembling anthrax.

I shall describe first briefly the technique and findings in a small series of cases in which I removed the tonsils, which were studied bacteriologically by Dr. J. C. Meakins. Most of these were from the wards of the Johns Hopkins Hospital and represent the cases of acute articular rheumatism admitted during a short period. These cases seem to me to be of importance and interest, as they furnish additional evidence to prove that the tonsils, and tonsillar ring are frequent portals of entry and foci of infection. All were adults whose faucial tonsils were diseased. The tonsils were enucleated under cocaine anæsthesia by Worthington's method. They were carried in sterile receptacles to the laboratory and cultures taken in three ways. These Dr. Meakins classifies as external, internal, and autolized cultures. The external were taken from the depths of the crypts; the internal through a

sterilized cut surface from the interior and grown on slant glycerine-agar and agar plates. The autolized were made as follows: the tonsils were first washed for one minute in a 1-1000 solution of bichloride of mercury, then in sterile salt solution; after this they were placed in either broth- or milk-culture flasks.

External Cultures.—In all of these streptococci and staphylococci predominated. Other organisms, bacilli or diplococci, were also found.

Internal Cultures.—In five cases the streptococcus was found in pure culture; in four streptococci and a few staphylococci; in one streptococci and a few bacilli, and in one no organisms.

Autolized Cultures.—In seven cases a pure culture of streptococcus was separated. In one streptococci and a few other cocci (4 foreign colonies in 2 plates) were found; in one the *Staphylococcus pyogenes aureus* principally. In two the results were negative.

Case 1.—Mrs. ——, æt. 40 years, white. Admitted March 18, 1907.

Diagnosis.—Acute articular rheumatism.

Complaint.—Sore throat and rheumatism.

Family History.—Negative.

Personal History.—Usual diseases of childhood, but no diphtheria or scarlatina. Has suffered from tonsilitis from her 13th year. When 14 years old had an attack of acute articular rheumatism affecting both ankles and wrists.

Present illness began 7 weeks ago with an attack of quinsy in which the abscess ruptured into the throat. Two weeks ago both shoulders, hips, knees, and elbows became very tender, painful, hot, and slightly swollen.

Physical Examination.—Joints above mentioned painful and tender but not swollen.

Slight mitral systolic murmur.

Very little tonsillar tissue seen. Slight amount of exudate in the crypts. Cultures from the throat gave an almost pure culture of streptococcus. The opsonic index to streptococcus was 0.65.

The tonsils on dissection proved to be much larger than expected, and belonged to the almost completely submerged variety.

May 1. Patient left hospital much improved, still having some pain at times and slight stiffness.

The internal and autolized cultures gave a pure growth of streptococcus.

Discharged May 1.

Case 2.—Mr. ——, æt. 19 years, white. Admitted March 20, 1907.

Diagnosis.—Acute tonsillitis. Acute articular rheumatism. Acute mitral endocarditis. Ascaris and trichiuris infection.

Family and *Personal History.*—Unobtainable.

Physical Examination.—Joints affected. Pain in right elbow, hips, right knee, and behind neck; the elbow is hot, red, and swollen.

The tonsils on admission were large, red, and acutely inflamed. No exudate present. On the post pharyngeal wall is a thick greenish purulent secretion. Pus is seen in the right nares, about the middle turbinate and on the inferior turbinate. On exploration of the antrum about a week later a slight mucoid discharge was found.

April 12. Tonsils dissected out.

April 26. Still has at times slight pains in joints. Has improved very much and has gained weight.

Internal cultures showed pure streptococcus. Autolized cultures negative.

Discharged.

Case 3.—Miss. ——, æt. 32, white. Admitted February 28, 1907.

Diagnosis.—Arthritis deformans. Acidosis.

Complaint.—Stiff and swollen joints.

Family History.—Negative.

Personal History.—No history of tonsillitis. Has had an occasional sore throat; as a child had "catarrh."

Present Illness.—Duration 4 years. Knuckles gradually enlarged, no pain. One year later the wrists were affected; they were swollen but not painful. Two years ago the shoulders were attacked. Now the right knee is swollen and painful.

Physical Examination.—Nasal examination revealed no signs of accessory sinus disease. A few diseased crypts were found at the apex of an atrophied tonsil. A slight amount of tonsillar tissue was removed by dissection. Cultures from this, internal and autolized, demonstrated streptococci alone.

She was treated with injections of dead streptococci, and when she left the hospital June 10 she was much improved.

Case 4.—History lost.

Case 5.—Mr. ——, æt. 29, white. Admitted March 27, 1907.

Diagnosis.—Acute articular rheumatism (2d. admission).

Family History.—Unimportant.

Personal History.—Negative. No history of tonsillitis or sore throat.

Present Illness.—In 1903 pain in various joints, but no redness or swelling. Was unable to walk or move legs.

Complains of pain in left knee and sterno-clavicular joints. Was hoarse and had sore throat several days before this attack.

Physical Examination.—Left knee joint swollen, hot and red. There is diffuse tenderness, and the right ankle is swollen.

A little muco-pus seen in left nostril about middle turbinate. Tonsils enlarged, otherwise not diseased.

April 19. Small fibrous tonsils dissected out. No rise of temperature following operation.

Internal cultures from tonsils showed streptococci and a few staphylococci. Autolized cultures contained only streptococci.

Discharged well April 30.

Case 6.—History lost.

Case 7.—Dr. ——. Tonsils removed as a prophylactic measure after an attack of tonsillitis. Patient was subject to frequent attacks of tonsillitis. These, however, had not been followed by any sequelæ. Both internal and autolized cultures showed only streptococci.

Case 8.—Mr. ——, æt. 26, white. Admitted April 26, 1907.

Diagnosis.—Hypertrophied tonsils. Acute arthritis (convalescence). Mitral stenosis.

Complaint.—Patient is convalescent from an attack of acute arthritis and comes into the hospital to have tonsils removed.

Family History.—Unimportant.

Personal History.—Has had measles, mumps, pertussis, scarlatina, and rheumatism. Had scarlatina when 14 and rheumatism (knee joints swollen and painful) when 16 years old.

Present Illness.—Commenced March 8 with headache and slight sore throat; on March 13 the patient suffered from severe cough and later expectorated blood. On March 15, the knee joints became stiff and painful. These cleared up in a few days, and the patient began to have shortness of breath, and pain in the chest, running down the arm.

April 26. Large submerged tonsils were dissected out. Considerable hemorrhage at night necessitated the use of Monsel's solution. Temperature for two following days rose to 100.5° and

patient had slight earache. Both internal and autolized cultures showed pure growths of streptococci.

Discharged April 30.

Case 9.—Miss ——, æt. 32, white. Admitted May 20, 1907.

Diagnosis.—Acute infectious arthritis. Chronic tonsillitis.

Complained of enlarged tonsils.

Family History.—Unimportant.

Personal History.—Tonsils have been enlarged since childhood. No history of attacks of tonsillitis or quinsy.

Present Illness.—Five weeks ago had swelling of right hand and forearm, which was pronounced inflammatory rheumatism by her doctor. Had pains in various parts of her body. This lasted 2 weeks.

Physical Examination.—Knuckles of first and second fingers are swollen. Hands are held flexed and cannot be completely extended. Exostosis on right wrist. Both ankles slightly enlarged, motion is not impaired. Tonsils on dissection proved to be very badly diseased. The crypts were full of a cheesy-looking material. Temperature rose to 100° one day after operation, then fell to normal.

Internal cultures of these tonsils demonstrated streptococci and a few bacilli. Autolized culture showed pure growth of streptococci.

Discharged May 21.

Case 10.—Mr. ——, æt. 30 years, white. May 20, 1907.

Diagnosis.—Acute articular rheumatism. Hypertrophied tonsils.

Complaint.—Rheumatism.

Family History.—Mother suffers at times from rheumatism; otherwise unimportant.

Personal History.—Has had measles, diptheria, scarlatina, mumps, chicken pox, and typhoid fever.

Present Illness.—In the latter part of February had an attack of tonsillitis. This was immediately followed by pain in the left knee and afterwards in numerous joints. Has just come from Atlantic City where he has been during this illness.

Physical Examination.—The joints of the lower extremities are somewhat stiffened, though the function is fair. Slight thickening of the joints of the upper extremity.

Tonsils hypertrophied.

May 20. Tonsils were dissected out; they were much larger than they appeared to be. No rise in temperature after the operation. Urine negative.

December 12. Patient is in very good health. No signs of his rheumatic trouble (report from mother).

Internal cultures demonstrated mostly streptococci and a few staphylococci. The autolized cultures were negative.

Case 11.—Mr. ——, æt. 27 years, white. Admitted April 27, 1907.

Diagnosis.—Acute articular rheumatism. Chronic tonsillitis.

Family History.—Unimportant.

Personal History.—No history of attacks of tonsilitis. Had an acute coryza two weeks previous to this illness.

Present Illness.—Began three weeks ago with pain and swelling in the left ankle. Then the other joints of upper and lower extremity became affected. On admission the right elbow was acutely inflamed, and both shoulder joints and left ankle were very tender.

Physical Examination.—Joints affected as above described. Heart normal. Both tonsils very large. Pus seen in right nares, about the middle turbinate and over the inferior turbinate. Pharynx and post nasal space atrophic. Vocal cords reddened.

Tonsils removed May 23. May 31 a note made saying that arthritis has wonderfully improved.

July 2. Is now able to walk. Temperature at times goes up to 100°. No pain on passive motions of the joints excepting in the left knee.

Internal cultures of these tonsils were negative. Autolized cultures showed streptococci with four colonies of a foreign coccus in two plates.

Resume of Cases and Conclusions Regarding Tonsils.

In two of the series of cases which Dr. Meakins studied bacteriologically the histories have been lost. In one case the tonsils were removed as a prophylactic measure several weeks after an attack of tonsillitis. These were of the submerged variety and both internal and autolized cultures demonstrated streptococci in pure culture. Seven of the remaining eight were cases of acute articular rheumatism. In five of these, the tonsils were definitely hypertrophied, in two they were not. In four of them a streptococcus was found in pure culture, in two streptococci and staphylococci, in one streptococci and other cocci, in one streptococci and a few bacilli.

In one case of arthritis deformans streptococci were found in pure culture. This case was treated with streptococcus vaccine and improved markedly.

In five of the arthritis cases no note was made in the history of previous attacks of tonsillitis. At the onset of the disease in one case, the patient had "sore throat," another had quinsy, and another simple tonsillitis. One patient had two weeks previously an acute coryza. No note as to throat symptoms is found in the other histories.

Two of the cases had a serious complication, an endocarditis of the mitral valves. Both of these were cases in which the streptococcus was found in pure culture internally. In one of these the opsonic index to the streptococcus was 0.65. In another case of acute articular rheumatism complicated by mitral and aortic disease, streptococci were found in pure culture in the tonsillar crypts and in this case the opsonic index was 0.55.

All of these cases left the hospital a short time after the removal of the tonsils either well or much improved.

Besides this series of cases of acute arthritis, I have had a number of the more or less chronic variety, but sufficient time has not yet elapsed to draw conclusions. In all, however, the tonsils even though not apparently morbid, have disclosed evidence of disease after their removal. In some pus was seen to exude from between the anterior pillar and the tonsil, in others cheesy matter was expressed from the crypts. Even though this may not be seen on removing them, careful bacteriological examination will often reveal virulent organisms in the depths.

Our conclusions from the above observations are:

(1) That bacteria penetrate deeply into the substance of diseased tonsils.

(2) That all tonsillar tissue that appears hypertrophied should be treated or removed. All evidence points to the ready penetration of bacteria and injurious substances into their interiors, in many cases leaving no visible sign of such penetration. In the present state of our knowledge we have no method of pointing out the dangerous varieties of tonsils.

Any functions that they may perform, will be carried on by the tonsillar tissue that always remains even after the most careful removal. There are no reports in the literature of damage done by such removal.

(3) In all cases where there has been a history of repeated attacks of tonsillitis, this should constitute a cause for their removal, although they do not look diseased.

(4) In all infectious diseases the lymphoid tissue of the throat should be carefully examined as a possible focus of infection.

(5) The marked and immediate improvement in the series of cases reported, substantiates the above conclusions.

(6) The organisms found in the tonsils in the cases reported are probably the causal agents of the attacks of acute articular rheumatism.

The Paranasal Sinuses as Portals of Entry.

We are just as much in the dark in regard to the functions of these cavities as we are regarding those of the tonsillar ring. Accumulating evidence seems to point to them as a frequent focus of distant infections.

We have a number of carefully worked out series of autopsies on these cavities by various authorities. Fraenkel found 43.1% of diseased sinuses, Gradenigo 22% (antra only examined), Lapalle 32%, Martin 48%, Kirkland 32%, Wertheim 47%, Oppikofer 48%.

All authors agree in the great percentage of diseased cavities, but there is considerable difference of opinion regarding its significance. Fraenkel, Wertheim, Kirkland, Darling consider that the diseased cavities may be a source of general infection. Wertheim mentions three ways in which this occurs: (1) Swallowing the secretion; (2) aspiration of the secretion into the lower air passages; (3) absorption of toxins. I would like to add to this a fourth, namely, absorption by the blood or lymph of the causal organism. We must rely mainly on our clinical data to prove this, for as yet there are no more exact methods.

Kirkland examined the various cranial sinuses in 100 consecutive autopsies at the Sydney Hospital. He found a remarkably high percentage of the patients dying of pneumonia had suppurative disease of these cavities (50%); and believes that usually the sinus disease is secondary to the pneumonia; but he reports some interesting cases of pneumonia and peritonitis, bronchiectasis, bronchitis and gangrene of the lungs in which he considered the sinus trouble to be the primary cause. In two cases bronchitis were cured after treatment of the antrum of Highmore.

In 360 nasal obductions Wertheim found 165 cases of diseased sinuses, *i. e.*, 46%. Of these 96, or 23%, were cases of empyema. He also found a high percentage of pneumonia cases had sinusitis, 9 out of 16 cases, or 56%. He says that tuberculosis predisposes to sinus trouble, for he found 31 empyemata in 106 cases of tuberculosis, or 29%. Four cases of syphilis had empyemata. The author notes the difficulty in determining whether the disease is acute or chronic but thinks that the majority of his cases were of the chronic variety. He mentions the fact that even clinically in both acute and chronic sinus cases, on opening the sinus at operation secretion may be present in but small amount, or altogether absent. The usual findings in his cases were an infiltration of the epithelium with numerous polymorphonuclear leucocytes, round cell infiltration in the sub-epithelial zone, less in the periosteal zone, and an edematous infiltration of the entire tissue. A sclerotic condition was rarely found.

In a recent communication, Darling gives the results of 52 autopsies in which the various sinuses were examined. Of these 37 were cases of pneumococcus infections, 15 were of control cases. Of the pneumococcus infections 92% had purulent sinusitis, of the controls (anemia, intestinal trouble, broncho-pneumonia, etc.) but 28% had a sinusitis. Of the pneumococcus cases there were 22 cases of lobar pneumonia, 9 of acute meningitis, 1 of acute pericarditis, and 5 of septicæmia. This writer considered in all these cases of pneumococcus infection, that the changes in the sinuses indicated a chronic inflammation. He believes the accessory nasal sinuses to be the portals of entry of the pneumococcus.

In a recent article (1906), Oppikofer gives his conclusions on this subject. These are based on the results of 200 nasal obductions. He found 47% of the cases had inflammation of the sinuses, and of these about 25% were purulent. He says it is practically impossible to determine by histological examination whether these cases are acute or chronic, and considers that most of them are of the nature of terminal infections. In only 3 out of 23 cases did careful rhinoscopic examination show sinus disease.

In the case that I here report the relationship between the sinusitis and the joint trouble can hardly be disputed. It illustrates very clearly that it is necessary to examine these cavities as a possible focus of infection. Diagnostic methods are still imperfect and there is no doubt that even the most expert rhinologist overlooks cases of this kind. The great disproportion between autopsy statistics and clinical facts points to this conclusion. I do not agree with Oppikofer that the majority of these cases are terminal infections, first because in certain diseases (*e. g.*, pneumonia), such a large number of cases occur, and secondly the histological changes oppose this view.

Mr. ——, white, æt. 31 years. Carpenter.

Diagnosis.—Spondylitis. Right chronic sphenoiditis and ethmoiditis. The patient was referred to me by Dr. Baer for examination of the nose and throat as he could not lie on his back on account of secretion flowing into the throat.

Family History.—Unimportant.

Personal History.—Some years ago he had suppuration in the right middle ear, and has had nasal trouble for years. In July, 1906, he was treated in the Johns Hopkins Hospital for pain in the hips and in the back of the right leg. After a short rest in bed, he left the hospital much improved. In November, 1906, the pains returned. There was marked sciatica and the spine was stiff and bent to the right. The patient was scarcely able to sleep at night.

Present Illness.—In January, 1907, he was again admitted to the hospital with the same condition. He was unable to bend the

spine. He has had a discharge from the nose for six years. He has pain in the back of his head and his ears at times.

Physical Examination.—An abundant purulent discharge is seen in the right nares between the middle turbinate and the septum. The turbinates are atrophic. The left nares is negative. The pharynx and post nasal space are atrophic. The posterior wall is covered with muco-pus. The larynx is normal.

Treatment.—Up to this time the treatment of the spondylitis had been ineffective. He was unable to lie quietly on his back and the bakings did not do much good.

The right middle turbinate was removed and the posterior ethmoidal cells and sphenoidal sinus were laid wide open by means of Hajek's hooks and Cordes' sphenoidal instrument. There was considerable necrosis of these cells and they were thoroughly curetted. This operation was done in January. The improvement in the spondylitis was immediate. Dr. Baer said it cleared up as if by magic. In February the nose looked very clean. In March he was shown at the Johns Hopkins Medical Society, when his back was straight and there was no limitation of motion.

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NOTES ON NEW BOOKS.

The Diseases of Children. A Work for the Practicing Physician. Edited by Dr. M. Pfaundler and Dr. A. Schlossmann. English translation edited by H. L. N. Shaw, M. D. and L. La Fétra, M. D. With an introduction by L. E. Holt, M. D. In four volumes. (*Philadelphia and London: J. B. Lippincott Company, 1908.*)

After a rather commonplace introduction by Holt, we find the scope of the work outlined in the preface. It was the aim of the editors to secure the collaboration of investigators who had enriched the subjects treated by original contributions from their pens, and when we cast our eye over the names of the different authors it appears that they have succeeded admirably in most instances. The editors evidently recognize the modern tendency of scientific medicine to put the physiological aspect of diseases in the foreground.

The scope of the work renders it difficult and, indeed, impracticable to give it a searching review, and we must rest satisfied to mention the main chapters, adding a few remarks here and there.

The first chapter "General Pathogenesis and Pathology of Childhood" is written by Hamburger in his usual interesting manner.

In the "Symptomatology of Children's Diseases" Pfaundler has set himself the laborious and difficult task of tabulating the symptoms of children's diseases and pointing out their possible significance. The result may serve to tide the practitioner over many a lapse of memory and become a guide to his diagnosis. The author, however, knows the limited value of his undertaking. "Even the simplest mental picture of a disease can no more be resolved into the sum of several symptoms than can a portrait into the successive strokes of the artist's brush. The result in either case would be a caricature." Furthermore, the author does not claim a complete fulfillment of his task, nevertheless his labors will, no doubt, be rewarded by the assistance they will afford to many practitioners, even if there is still room for some improvement. The special index to this part is a welcome addition.

"General Prophylaxis in Diseases of Children" follows. Here Bendix touches—in parts more detailed—on the most important precautions to be taken in order to secure the child's bodily and mental welfare. The treatment of the subject is in some places too indefinite, particularly with regard to overwork—sometimes perhaps the opposite—in school and home studies.

Neumann, in the chapter on "General Therapeutics in Diseases of Children" expresses the opinion that loss of appetite, due to constipation, a frequent enemy to health, is most readily removed. If he has in mind those cases of chronic constipation, which are the bane of many physicians, we should be much indebted to him if he would kindly tell us how. His advice to pay a little more attention to the taste of the little patient suffering from loss of appetite may sometimes be heeded with advantage, but when he states "sometimes severe disciplinary measures lead to a quicker and better result than can be obtained by other means" he, no doubt, comes very near the truth; at the same time the majority of the parents in this country can hardly be persuaded to adopt any severe disciplinary measures under such circumstances. The paragraph on "Psychotherapy" is rather short, although the author recognizes its value fully—and, indeed, this therapeutic agent has received rather scanty notice in the treatment of children thus far. It may well be that hypnosis will find a somewhat wider range of application than the author is willing to concede to it. The paragraph on "Hydrotherapy" will help, we hope, to introduce this form of treatment more among our pediatrists. It is truly remarkable how thoroughly this most convenient and effective therapeutic measure has been neglected. The paragraphs on "Mechanotherapy" and on "Combined Physical Therapy" are well worth reading. The subject "Electrical Treatment" is dismissed with a few words.

Praussnitz, writing on "Mortality and Morbidity in Infancy" commands us to be careful in the selection of statistical material and in the application of statistics. If his warning were heeded, it would save us from much imported and domestic rubbish. Curiously enough, the fact is not mentioned that in the preparation of the mortality statistics of artificially fed infants it is of importance to know whether the purity of the cow's milk taken by the infants has been up to our modern requirements.

The chapter on "Milk" is written by Raudnitz, who treated the same subject in the "Ergebnisse der Physiologie" and whose collective abstracts on milk chemistry in the "Monatsschrift für Kinderheilkunde" are a welcome aid to anybody interested in this subject. We encounter the same positive assurance and sometimes the slight lack of clearness, with which we have become acquainted in other contributions of this author.

"The Female Breast" is from the pen of Engel, whose association with the "Säuglingsheim" in Dresden puts him in a good position to treat such subjects as "Ability to Nurse," "Technique of Nursing," "Hygiene of the Nursing Woman," "Choice of a Wetnurse," etc. Some of the single paragraphs are a little scanty, and a fuller discussion of the contraindications of nursing as well as of the drugs eliminated through the mammary glands should have found its place in these pages.

Camerer, the younger, contributes the chapter on "Metabolism and Nutrition During the First Year of Life." Following in the footsteps of the elder Camerer, a pioneer in this field of investigation, he lays the greatest stress on the energy metabolism of the infant. And while it is made very plausible that the food requirement of the infant is mainly determined by its energy metabolism, still the other aspects of metabolism like nitrogen and mineral metabolism, etc., are of much importance and should have received a little more attention.

In the paragraph on "Nutrition and Metabolism of the Breast-fed Infant During the First Week of Life," the author states that it is undesirable to give the breast more than eight times during 24 hours and recommends 6-7 feedings, while later on he recommends for the first three months the same number of feedings. This recommendation differs from that advocated on the basis of stupid tradition in most of our American text-books.

The paragraph on "Artificial Feeding of Infants" contains this passage: "A uniform method, which must be adopted in every case of artificial feeding, does not exist. This fact is frequently cited at present to prove our lack of sufficient knowledge, but it simply shows that an infant may be reared by different methods." In the presentation of the artificial feeding, the American reader will be surprised at the absence of the frightful array of formulas and charts, with which he is customarily confronted. And while a $\frac{dx}{dy}$ may well be adapted to create in the mind of the unsophisticated reader the impression of the author's profound learning, its intrinsic value for infant feeding is very problematical. The shortness, with which the technique of artificial feeding is described—it occupying not quite three pages—is enough to make one gasp with wonder mingled, we must confess, with some admiration. The two paragraphs contain much good sense and are singularly free from decorative embellishments.

In the chapter on "Children's Growth in Weight and Height," the same author points out that the weight of an infant during the first year and even later is dependent to a certain extent on its birth weight, a fact very frequently neglected, when some authors want to feed babies up to a certain average weight for a given period.

A chapter on "Nutrition After the First Year" by Sommerfeld is enriched with a chart giving in graphical form the average composition of the more important articles of food employed in childhood; and the chapter "Composition of Urine and Feces After the First Year of Life" concludes the first volume.

Volume II begins with "The Diseases of the Newborn," by Knöpfelmacher. Eighty pages are devoted to this subject. The three chapters following are written by Rommel: "Prematurity and Congenital Debility" with a discussion of the principles and construction of incubators and the technique of feeding their inmates; "Asphyxia and Atelectasis" and "Scleroderma and Sclerema."

The "Diseases of Puberty" are treated by Seitz in an attractive though cursory manner. The importance of the statement, "The physiological sexual development is a critical period, requiring much insight and consideration from parents and teachers" is well recognized by many physicians, but not sufficiently, we fear, by parents and by school authorities.

Under the heading "Constitutional Diseases," several chapters are included:

1. "Diseases of the Blood and of the Blood-preparing Organs," by Japha. A special paragraph of nearly five pages is devoted to the "Anæmia of School Children," and it contains much that is

of interest. Hodgkins' disease is included among the rather ill defined forms of pseudoleukemia, it is not regarded as a disease, *sui generis*. The newer American literature is not taken into consideration (Reed, Longcope, etc.). It is true that the presentation of diseases of the blood, etc., is difficult, and, therefore, it is not surprising that we find room for much improvement in this part. Perhaps it would not be amiss to include here a discussion of the bacteriology of the blood, if the editors do not decide to give it a separate chapter.

2. "Hæmorrhagic Affections," by Hecker. This chapter includes hæmophilia, the different forms of purpura, scorbutus, and paroxysmal hæmoglobinuria.

3. "Infantile Scurvy," by von Starck.

4. "Rachitis," by Stoltzner, a believer in phosphorus medication.

5. "Diabetes Mellitus," and 6. "Diabetes Insipidus," both by von Noorden, whose special fitness to treat these subjects need not be pointed out.

7. "Scrofula," by Galge. The author adheres to the old term "scrofula," because he is of the opinion that even the most ingenious attempt to separate the affections previously classified under that name have only contributed to increase the confusion. He accepts an hereditary predisposition, whatever that may be, and is inclined to regard the whole train of affections of tubercular nature.

The "Infectious Diseases" conclude the second volume. "Measles" are described by Moser and "Scarlet Fever" by von Pirquet and Schick. The illustration of the different symptoms by showing their occurrence in selected cases lends greatly to the value of this chapter. The differential diagnosis is given full consideration. The therapeutic measures recommended are based on personal observations, and this portion seems to be very satisfactory, although in one instance we cannot quite agree with the authors, and we should not like to dismiss offhand the administration of urotropin as a prophylactic measure against nephritis. The serum treatment is only used in severe cases, because large amounts are necessary, and these are likely to cause a more frequent occurrence of intense serum disease. "German Measles" and "Dukes' Fourth Disease" are described by Bókay, who is inclined to accept the latter as a special disease. Swoboda contributes the chapter on "Varicella," and Voigt that on "Vaccination." The chapter on "Diphtheria," by Trumpp is well written, and the translator's parenthesis calling attention to the desirability of large doses of anti-toxin is not out of place. After the description of "Mumps" by Moro, follows the chapter on "Typhoid Fever," by Fischl. The importance of the chronic carrier of bacilli in the spreading of the disease is not mentioned. The Brandt bath as a therapeutic measure is stigmatized as coarse and undesirable. The recommendation to strengthen the waning heart-power by bold alcoholic administrations lacks a sound physiological or pharmacological basis. The short chapter on "Dysentery," by Langer is followed by one on "Influenza," contributed by Spiegelberg, which gives, on the whole, equal satisfaction as the next chapter on "Whooping Cough," by Neurath. In the etiology of "Acute Articular Rheumatism," by Ibrahim, the newer work of the English investigators may have deserved notice. The more important forms of specific arthritides (*i. e.*, due to different microorganisms) are described briefly. The description of "Chronic Articular Rheumatism" seems to be rather unsatisfactory. The whole chapter on rheumatism needs revision. For instance, the tonsilar infections in their possible relation to rheumatic affections are dismissed in a rather arbitrary manner.

The next chapter is a treatise on "Syphilis." It is sufficient to mention the name of the author, Hochsinger, whose classical studies of this disease are well known.

The chapter on "Tuberculosis" is signed by Schlossmann. The author is of the opinion that a not insignificant number of cases are of hereditary origin, although this mode of infection is by no means the most important one. We find the following sentence printed in italics: "Finally we must repeat that a successful campaign against tuberculosis can be waged only if we prevent infection during childhood. For it is during this period of life in the great majority of cases that the infection takes place, although the disease may not become manifest until later in life."

We expected much valuable information with regard to the time of infection from vaccination according to the method of von Pirquet, and perhaps from the ocular reaction of Wolff-Eisner and Calmette, but both of these methods did not exist when this chapter was written. We must, therefore, confine ourselves to the mention of the further statement that milk does not play an important rôle in the genesis of the disease, as it is generally cooked previous to being used. The problem of the transmission of tuberculosis by means of milk deserves a little more attention in the next edition.

The third volume opens with the "Diseases of the Digestive System," and the first chapter is Moro's description of the "Diseases of the Mouth." There occurs a little lapse on the first page, where potassium sulphocya*nide* is given as a characteristic ingredient of the adult's saliva. It should read sulphocya*nate*. The syphilitic and tubercular lesions of the mouth should have received a passing attention, if no more. The so-called Riga's disease, it may be mentioned, has been observed in America, too. Difficult dentition as a morbid entity with all kinds of consequences is accepted with a readiness which should have been guarded in view of the violent storms of discussion through which this foster-child of the windy clinician has passed. "The Diseases of the Tonsils, Pharynx, and Œsophagus" are described by Finkelstein.

The "Diseases of Nutrition in Infancy," by Fischl, occupy about 89 pages. The title more commonly seen is gastro-intestinal disturbances, but, owing to the efforts of Czerny and Keller, the title given above gains ground steadily. In reviewing a work of the scope of the one before us, we must necessarily refrain from a detailed discussion of this chapter. The enormous variety of these ailments and their infinite transitions from one to the other render a satisfactory classification well-nigh impossible. A detailed classification will always arouse a great deal of dissension and a more general one, like that of the author, inasmuch as it does not share the same fate, will be of relatively little use to the practitioner. But we should expect in the presentation of this subject that the author would pass in review all the different factors, dietary, bacteriological, pathological, etc., which probably participate in the nosology. And of this task the author has acquitted himself on the whole very creditably. We must restrain from entering upon the discussion of the single groups and the therapeutic measures proposed, although we cannot subscribe to all the author gives us. But with regard to immunization therapy in cases where infants respond with severe signs of intoxication to even small amounts of cow's milk, we must recommend greater caution in the light of the researches of Anderson and Rosenau concerning anaphylaxis.

The "Local Diseases of the Stomach and Intestines in Earlier Childhood," as well as "The Gastro-intestinal Diseases of Older Children" come from the pen of the same author. The next edition will no doubt contain the new paraffin treatment of prolapsus recti.

The chapter on "Pyloric Stenosis in Infancy," by Pfaundler, gives a clear and concise picture of this disease.

Selter, writing on "The Diseases of the Appendix" does not advise immediate operation in every case of appendicitis or periappendicitis, but still concedes an important part to the expectant treatment. A consideration of Simon's septic factor would not have been amiss. The chapter on "Herniæ in Children," is by the same author, and Langer, considers the "Animal Parasites."

The "Diseases of the Peritoneum" and the "Diseases of the Liver" are described by Stoos.

In the next chapter Freund treats of the "Pathology of Metabolism." The main points known at the time of the writing are clearly stated by the author, who has contributed much original work to this subject. The reader must be impressed by the scarcity of valuable data at our disposal and also by the importance of this field of investigation. Anybody conversant with the American pediatric literature must feel keenly the utter neglect of this most important branch of pediatrics barring few exceptions, and that in spite of the fact that there exist in this country several well-appointed children's hospitals, where such researches could have been undertaken very readily. The advances in one of our most important branches—the establishment of infant feeding on a sound, scientific basis—*must* come through this channel. It is true, this work requires earnest and honest application, and it is a question of slow and cautious progress. The work of many hours will yield only relatively few printed pages and the results will not appeal to the masses. We hope sincerely that the next edition will be able to chronicle progress made on this side of the Atlantic.

In the next chapter, "Intestinal Bacteria," we encounter its author, Moro, in his own field.

The "Poisons" are considered by Schlossmann, while the "Diseases of the Nose, Trachea, Bronchi, Lungs, and Pleura" are described by Feer in an able manner. Gallatti contributes a brief chapter on the "Diseases of the Larynx." The "Diseases of the Thymus, Status Lymphaticus and Sudden Death in Infancy" we find over the signature of Friedjung. If the reader expects to find a detailed discussion of the status lymphaticus he will be disappointed, for it is only considered in connection with the explanation of sudden death associated with an enlargement of the thymus.

Hochsinger contributes the "Diseases of the Circulatory System." The author adheres to his assumption of the complete absence of accidental (so-called anæmic) heart murmurs during the first years of life, although he states that exceptions have been taken to this view.

The chapter on "Diseases of the Thyroid Gland" by Siegert, concludes the third volume. Here several affections are included which do not seem dependent on any demonstrable changes in the thyroid as infantile myxidiocy, mongolism, and micromelia. The parathyroids are not taken under consideration.

The fourth volume begins with the "Diseases of the Urogenital System," by Langstein. The statement that creatinin has not been demonstrated in the urine of healthy, milk-fed babies must be corrected. In the description of the different forms of nephritis more stress should be laid on the consecutive conditions of the heart. The subject is treated in 110 pages, and the omissions are few. It may be somewhat doubtful whether Addison's disease finds its proper place in this chapter.

The "Peculiarities of the Child's Nervous System" written by Pfister are followed by the "Organic Diseases of the Nervous System." Zappert has accorded to this subject in about 160 pages the careful treatment which might have been expected from this author. The name of Thiemich is so intimately connected with "Functional Diseases of the Nervous System" of childhood, that his signature under this title is not a matter of surprise. The usual forms of tetany, laryngospasm, and eclampsia infantum are considered as different manifestations of the spasmophile diathesis. Certain forms of laryngospasm and eclampsia infantum do not belong to this general group, and may be differentiated from the usual forms. In a separate paragraph the spasmophile diathesis is given as a clinical entity, and the influence of diet is pointed out. Its relation to the parathyroids is regarded as doubtful. Teething as a reflex cause of a convulsive attack on the basis of the spasmophile diathesis is absolutely denied. The efficiency of phosphorus and cod-liver oil in this condition, we may mention, may perhaps find its explanation in an influence on the calcium metabolism.

The whole presentation of the subject is eminently satisfactory. Epilepsy, neurasthenia, and hysteria pass before our view in a masterly manner. Some points may be open to discussion, but, as a whole, we doubt whether these subjects have ever been presented in such an attractive and interesting form, at least in the literature of pediatrics. The chapter on "Psychoses" suffers by comparison with the preceding chapters, and it deserves more space than four pages.

The same author contributes the "Diseases of the Meninges." We are rather surprised that the method of demonstrating the presence of tubercle bacilli in the sediment of centrifugalized cerebrospinal fluid is not mentioned. This method proved very successful in the hands of Bernstein in this country. The author concludes his description of meningococcus meningitis with these words: "Following the trend of the times a number of modern authors base their hopes upon a future serum therapy." We owe it to Flexner that this hope has, to a certain extent, found such a speedy fulfillment.

Galewsky devotes 89 pages to "The Most Important Diseases of the Skin." The American reader would have liked to find included the skin affections due to poisoning with Rhus toxicodendron.

With Leiner's description of "The Tuberculous Lesions of the Skin" the fourth and last volume finds its conclusion. Throughout the work numerous excellently executed illustrations and charts form a very attractive feature, and in many instances aid the understanding considerably.

We are aware that our review has been a rather cursory one. Here and there our criticism may have been too lenient and we may have failed to point out more or less important omissions, but, as a whole, we are afraid that we have sinned more in the opposite direction. We must express a pardonable envy, if we contemplate the many active workers who have left a distinct imprint on their fields of investigations, and who have lent their support to the editors. The list of authors does not include all the best names. The editors themselves, Pfaundler and Schlossmann, rank high in pediatrics.

We believe that the American editors, Shaw and La Fétra, had a twofold object in view when they undertook their labors; first, to introduce the American reader, who may have no access to the foreign literature, to the views governing pediatrics in the German-speaking countries; and, second, to stimulate investigation along the lines indicated in the work. The first object they have accomplished as much as lay in their power with the willing help of the many translators, who have acquitted themselves of their task with credit. Whether they will accomplish their second object, the future only can show. But if not all the signs are deceptive, it seems that the younger pediatricians of this country are ready to liberate themselves from the baneful influence of a few self-constituted authorities and to participate in the free development of pediatrics on the basis of sound scientific principles.

S. A.

Diseases of the Nervous System. By H. Campbell Thomson, M. D. (Lond.), F. R. C. P., etc. With 8 colored and 12 black-and-white plates, and 101 figures in the text. Price, $2.75. (*Chicago: W. T. Keener & Co., 1908.*)

Dr. Thomson states in his introduction that in this volume his constant aim has been "to bear in mind the principal difficulties which are apt to beset the student"; and he has succeeded in his object and has written a serviceable manual, which may be recommended without any restrictions to those beginning the study of nervous diseases. In a small octavo volume of less than 500 pages, the author has presented the subject in an attractive and

clear manner, so that his book makes an admirable introduction to the larger volumes on nervous diseases. The publishers are doing an excellent work in bringing out a number of first-class English works in agreeable form. R. N.

Meat and Food Inspection. By Wm. Robertson, M. D., D. P. H. F. P. S., etc. With Regulations Governing Meat Inspection in the United States. By Maximilian Herzog, M. D. Price, $3.50. (*Chicago: W. T. Keener & Co., 1908.*)

In the first half of this book the author discusses certain questions concerning meat and food inspection which are of common interest to all inspectors, but the second half is devoted to the laws which govern this problem in Great Britain, and these are of interest only to a select body of students, who are anxious to know how this inspection is controlled abroad as well as at home. It is a pity that the author did not make two distinct volumes of his work, for thus it would have had a better sale, at least in this country. It is to be feared that but few will purchase the volume, because of its expense, and because so much of it is devoted to that side of the question which does not appeal to the general reader. It is none the less a book to be recommended to all inspectors, for Dr. Robertson has had a wide experience, and has presented his information on the subject in a clear and concise manner. Other larger and more comprehensive works on food inspection exist, but this is a good one, especially adapted to the inspector who has not had a thorough training, and to the general practitioner who is anxious to have some knowledge of this subject. It would be well if all our country practitioners had a volume as excellent as this one on their shelves, for they should be able to instruct the farmers on many points in regard to furnishing milk and food to the community. It is this large body of doctors who can do much to eliminate illness in the cities by teaching their patients in the country how to keep their stables and barns clean. To these doctors this volume will prove really serviceable. R. N.

Transactions of the National Association for the Study of Epilepsy and the Care and Treatment of Epileptics. Seventh Annual Meeting, Richmond, Va., October 24, 1907. Vol. V. Edited by Wm. P. Spratling, M. D., Superintendent of the Craig Colony for Epileptics, etc.

The most notable paper in this volume is that by Dr. C. C. Southard, entitled "Observation of Histo-Pathology in Epilepsy, Submitted in Competition for the Prize of $500 Offered for the Best Essay Bearing upon the Etiology of Epilepsy, the Paper being Awarded Honorable Mention." The author's summary in brief is as follows: "The theory of epilepsy expounded in the present paper is founded mainly upon structural considerations. The histological data have been interpreted largely from a functional point of view. The theory lays claim to some originality in two directions, in setting forth, namely: the properties of a typical epileptogenic focus in the cerebral cortex and the nature of that change in cortical tissue which favors epileptic discharges." There are numerous briefer papers by other members of the association, dealing with certain distinctive features of epilepsy in a practical way. An important part of the volume is the "Report of the Public Care of Epileptics from States, Foreign Countries, and Municipalities." Like so many other associations this one suffers from lack of means to pursue certain courses which it is anxious to do, and yet there are few associations which deserve more general and generous support. Epilepsy, if not a national, is at least a State problem, and should be handled in a broad-minded way. Our legislators must be taught the present sufferings and needs of epileptics, and must learn that this unfortunate class cannot be left to take care of itself, and should not be roughly classed with the insane. It is a problem like that of tuberculosis, insanity, and venereal disease, which must be sooner or later solved, and the solution will only be reached by co-operation between the public and the medical profession.

R. N.

Golden Rules of Dietetics. The General Principles and Empiric Knowledge of Human Nutrition; Analytic Tables of Foodstuffs; Diet Lists and Rules for Infant Feeding and for Feeding in Various Diseases. By A. L. Benedict, M. D. Price, $3.00. (*St. Louis: C. V. Mosby Medical Book and Publishing Company, 1908.*)

The author has failed to digest well all the information that he has collected, and the result is unsatisfactory. A more appropriate title for the book would have been "Dietetics"; it is impossible to discover what the "Golden Rules" are. It is unfortunate that so few of the medical profession can write lucid and grammatical English—there are many passages in this volume that suffer from the author's impossibility to express his meaning clearly, and according to the first principles of grammar. Had the author been willing to write a simple little hand-book on dietetics he might have produced a useful volume, but there are many books, no larger than this one, which deal far more satisfactorily with the subjects discussed. R. N.

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CONTENTS.

	PAGE
A Comprehensive Plan for the Treatment of the Tuberculosis Problem. By Victor G. Bloede	349
The Axillary Diastolic Murmur in Aortic Insufficiency. (Illustrated.) By Rufus Cole, M. D., and Arthur Bond Cecil, A. B.	353
Certain Clinical Features of Cardiac Disease. By G. A. Gibson, M. D., LL. D.	361
The Practical Value of the Demonstration of *Spirochæta Pallida* in the Early Diagnosis of Syphilis. By J. T. Geraghty, M. D.	364
The Contrast in the Excretion of Chlorine in Influenza Pneumonia and in Ordinary Lobar Pneumonia. (Illustrated.) By Leonard George Rowntree, M. D.	367
Notes on New Books	373
Books Received	375
Index	376

A COMPREHENSIVE PLAN FOR THE TREATMENT OF THE TUBERCULOSIS PROBLEM.[1]

By Victor G. Bloede,

Chairman of the Executive Committee, Hospital for Consumptives of Maryland (Eudowood), Baltimore, Md.

It is not the purpose of this paper to discuss any new plan for fighting tuberculosis, nor indeed have I such to offer, but my object will be to consider as the only comprehensive and really adequate plan for the treatment of the whole matter the co-ordination, bringing together and working in conjunction under one harmonious management, of the various powerful single factors already so successfully at work in this field.

It is a strange fact that nearly every community which has awakened to the importance of taking measures against this disease has commenced the work by the establishment of sanatoria for incipient cases, while advanced patients, the chief factors in the spread of the disease, and directly or indirectly responsible for the large majority of all our incipient cases, have remained uncared and unprovided for.

In another way this general beginning at the wrong end, so to speak, in giving sanatoria the first consideration while advanced cases are neglected, has deprived the cause of much of its force with the public in that the care of incipient cases, dealing as it does with people who look well and recover, and whose real condition is only apparent to the skilled physician, does not appeal to the sympathy of the masses as those advanced cases in which the extreme illness and suffering of the afflicted person become apparent to the most unobserving and instantly enlists the sympathy and aid of their fellowmen.

This all but universal first attention to the early cases instead of the advanced cases has therefore in my opinion been one of the great drawbacks to the more rapid progress of our work.

Another drawback is to be found in the fact that not sufficient effort has been made to convince the larger public that every community within itself is amply able to finance the factors necessary to battle successfully with this great problem if only its full significance to every home and household were clearly understood. Right here it may be advisable to call attention to the fact that in order to avoid any just criticism and to hasten the progress of the cause, it is absolutely necessary to secure a sound, business-like and economical administration of the funds the public is called upon to furnish and to be able to show clearly that every dollar that is given by the public or state is bearing fruit in the restored health, activity and usefulness of those who are suffering with this terrible malady in its early or curable form, and providing the greatest

[1] A paper read before the International Congress on Tuberculosis, Washington, D. C., September 30, 1908.

possible comfort and happiness to those unfortunates who are marked for death.

It may be proper in these preliminary remarks to refer to the question of the best location for the hospital, sanatorium and farm colony. Not many years ago, it was the general opinion that the successful treatment of consumption required a high altitude, and the result of this was that patients to receive treatment had to go long distances from the centers of population. I believe my honored friend, Dr. Philip of Edinburgh, Scotland, was among the first to combat this theory, and prove the entire efficiency of treatment near home by the establishment of the Victoria Hospital for Consumptives just outside the limits of this classic Scotch city. His opinion, based upon long practical experience is, I believe, that both hospital and sanatorium, and especially the former, should be in close proximity to the great centers of population. Our own distinguished fighter of the White Plague, Dr. Flick of Philadelphia, holds the same view, and claims that in his hospital in the very center of the busy city of Philadelphia, he can effect practically as many cures of curable cases as the average institutions far from the din of the great cities.

My own experience and study confirm this view. While no doubt the air at high altitudes is more grateful and healing to the lungs of the sufferers and the low temperature, especially in mid summer, may be conducive to more rapid recovery, it is nevertheless a fact that the best kind of work can be done right at home, in some quiet place just outside of our great centers of population.

One of the explanations for this I think lies in the mental attitude of the patient. Near home, and within easy reach of those dear to him, the pangs of homesickness are practically unknown, the patient's mind is at ease, and he gives himself up wholly to the treatment without experiencing the gnawing and destructive mental suffering to which the large majority of patients who are removed far from home and friends are subject. The mere feeling that they are within thirty minutes ride of their friends and family and can communicate with them at any moment, in my opinion begets a mental quiet more favorable to and potent in effecting a cure than the finest mountain air with a spirit of melancholy gnawing within.

I have already stated my proposition, namely, that to fight tuberculosis adequately, neither sanatorium nor hospital working as independent forces will prove most widely effective, and I will now proceed to the consideration of a plan which my experience of several years in this work leads me to believe would prove the most effective system that can be devised to secure rapid and permanent results.

This plan contemplates the combined and simultaneous operation of the four great agencies, each one indispensable within itself; viz.:

First, the dispensary.

Second, the hospital for advanced cases.

Third, the sanatorium.

Fourth, the farm colony.

All of these four great forces to be co-operating, and each one forming an integral part of one great system. I believe where such a combination can be made (and I see no reason why it should not be feasible everywhere), the end of the great white plague is within sight, at least of the coming generation.

In order to make myself clearly understood, I desire to briefly define the co-relation and co-ordination of all of these single agencies as I understand them, but before entering upon this subject, I wish to say a few words upon a subject about which we are all so often asked and that is, the proper organization for carrying out this work in any of our communities.

I should say that the first requisite is the awakening of the public in any given community to the importance of this work, not in the abstract, but in its bearing upon every home. There is no better or quicker method of accomplishing this than through the press, and I know from our own experience in this work that the power of the press is the greatest and most potent single element available for stimulating the public conscience and educating and awakening the public to the importance of the subject. I believe that to the work of the press of Baltimore, unselfishly and freely given at all times, a large part of our success, as well as financial support (contributed by all classes of our community), is due.

The church and church organizations should also be a great factor in this work, but for some reason or other this great influence has not yet taken its proper place in our work or made its true power felt in the way of practical results either by adequate co-operation in its propaganda, or financial aid secured through its appeals.

The next most important step to be taken in the line of organization is the selection of progressive men and women to direct the work, men and women who are workers and not too busy to give some time and thought to the cause of their less fortunate fellowmen.

These should be selected from different stages of our social order and from all walks in life, from the church, from professional, business and political life, from labor circles, in short wherever true interest is shown in our work, for humanity should know no caste. Next you should select from among this varied material a competent and aggressive managing committee. This committee should be made up of men possessing executive ability, who have had a good business training, and who command the confidence of the public. Last, but not least, a medical director must be found willing to put his best life's blood into this work.

Such men are not easy to find, but every large community has such material in its midst, and with the proper public support, the progress of the work will be rapid and gratifying. The limits of this article will not permit my going into further details, and I therefore have to content myself with a merely cursory reference to this most important subject of proper organization, upon which much of the success

of the movement must necessarily depend. Before leaving this subject, however, I desire to emphasize the fact that it *is not desirable to seek aid from state or municipality at too early a stage of the work* because even if a community is successful in obtaining it, the amount given is usually small and inadequate while the general public as a rule assume that when the state or city takes up a given problem the responsibility of the individual ceases, and as a consequence, their interest in the work lags, and the contributions from private sources dwindle.

After the proper organization has been effected on the lines indicated, the first important step is the establishment of

THE DISPENSARY.

To this dispensary all suspicious cases should be sent for investigation, diagnosis and classification. The dispensary has been fittingly called the clearing house for tuberculosis cases, and is the surest means the community can employ to promptly and accurately learn the condition of its sick, and to accomplish the greatest possible amount of good for the least expenditure of funds, as through it, the great majority of the cases in any community can be reached and instructions and help be given. In the larger cities this dispensary might form part of some general dispensary or hospital. In Baltimore, our institution has depended almost entirely upon the Phipps Dispensary of the Johns Hopkins Hospital for the diagnosis and classification of its cases, although we invite and receive the co-operation of other hospitals and dispensaries of the city. All applications received for admission to our hospital are first referred to the dispensary where a thorough examination and diagnosis of the applicant are made, our resident physician being one of the examiners, and upon this report our admission or rejection of the patients is based.

Those who have been active in this work know how difficult it is sometimes made for those in charge to reject patients whose admission is insisted upon by strong political or social influences. The applicant may for various reasons be unfit for admission, yet it may be a very difficult task for the board of directors to reject him. By requiring the certification of all patients by the dispensary physicians as an essential step, this trouble is wholly overcome, and when it is once understood that all social or political influences in the absence of such certification are disregarded in the admission of patients, a very unpleasant duty and responsibility is lifted from the shoulders of the directors. The dispensary of course should be in charge of some active physician who has made a specialty of the diagnosis and treatment of tuberculosis, and who has had the widest possible experience.

To be productive of the highest good, the dispensary should also be provided with visiting nurses who report upon the home condition of the patients in such cases where home treatment is considered sufficient, see that the instructions of the doctors are carried out, and persuade those who are exposed to possible infection to come to the dispensary for observation, diagnosis and instructions. It is not always necessary in the beginning to have paid nurses, as the work of the visiting nurse may be done with a fair amount of success by earnest volunteer workers drawn from the church or society. As the work grows, the medical director will have no difficulty in securing assistance from doctors interested in tuberculosis and his volunteer staff will generally be large enough to meet all requirements.

Those who desire a fuller and more detailed knowledge of the great work that can be done by this clearing house for the whole system (and which constitutes its first element) I would refer to Dr. Louis Hamman, the able and devoted head of the Phipps Dispensary, an institution which I believe, considering the small amount of money expended in its maintenance, produces as great results as are achieved anywhere in the world.

Our next consideration is

THE HOSPITAL FOR ADVANCED CASES.

Of all the single elements forming the system I suggest I consider the hospital for advanced cases the first in importance, for there is no argument which can gainsay its absolute necessity. It seems simply incomprehensible that a great state like Maryland, and many others, up to the present time have provided no place for the care and treatment of advanced cases of tuberculosis, or even a place for the hopeless invalid to die. Indeed up to last year we had only one sanatorium in the entire state, and that accommodating only about 30 patients for the 10,000 or more that are afflicted; less than the proverbial "Drop in the bucket."

Advanced cases being, as experience has shown us, the chief means of propagating and spreading the disease, should therefore in every instance be first provided for. This is the practical view of the situation, but in addition to this from the humanitarian standpoint, to leave advanced cases in their homes, not only to spread infection broadcast, but to gradually approach death after months or even years of worse than death, with improper food and inadequate care, is such fiendish barbarism as to make those of us who know these conditions wonder whether civilization is more than a name. In my opinion therefore, if conditions are such that only one of the various elements necessary to properly battle with tuberculosis can be employed in the community, the hospital for advanced cases should receive first attention. The site selected for such a hospital should be as near the center of population as possible, convenient to railroad or trolley, with a pleasant view, plenty of shade and good water.

It has been deemed advisable by some to locate such advanced-case hospitals in the center of cities, but in view of the fact that land can always be obtained in the suburbs, with freedom from noise and dust, and within easy reach, I see no possible advantage in such a plan, especially in view of the fact that it is now generally conceded that advanced cases should be treated as though they had every chance of recovery, and such treatment can certainly be best given in the country.

The type of building most efficient and economical is, in my opinion, one combining small wards with individual rooms

for the isolation of dying cases or those with disturbing or distressing symptoms such as persistent night coughs. A building of this type, which I think will be found very efficient, has just been erected near Baltimore, and I refer those interested in a further study of this subject to this design as it is the result of considerable study and experience, and contains some novel features. The hospital referred to has a central administration building of two stories with assembly hall, office, dining room and kitchen on the first floor, and staff quarters on the second floor. On each side are one story wings containing four wards of six beds, six isolation rooms, lockers, bathrooms, and wide piazzas upon which the beds can be wheeled. In the basement of the main building in addition to the necessary heating apparatus is a well equipped autopsy room, for pathological work. A laboratory for sputum and other examinations and research work is also to be provided for later.

A hospital for advanced cases built upon these lines gives the greatest efficiency in the treatment of these cases at a minimum cost both as to expense of construction and subsequent maintenance. Our plan also contemplates the construction of shacks and cottages later on for the accommodation of those advanced cases which have improved sufficiently during their hospital treatment to become ambulatory.

The next link in the chain is

The Sanatorium.

In our plan the sanatorium for incipient cases is built upon ground immediately adjoining the hospital for advanced cases, but at a distance of about one quarter of a mile so that while the two institutions are entirely separate so far as the communication of the patients is concerned (which, as you all know, is very desirable) the entire system is under one management. This insures the greatest possible economy in the control and maintenance of both institutions, the necessary supplies being furnished through one central station and the same resident physician having the management and control of both, thus avoiding unnecessary duplication of working forces.

In this country, as you all know, with few exceptions the cottage or shack system for sanatoria has been adopted and found most suitable.

The buildings may be of comparatively inexpensive construction, but expense should not be spared in making the patient's surroundings not only comfortable and hygienic, but as homelike as possible, for the tuberculosis patient, unlike the patient in a general hospital, spends months under our care, and hence the more comfortable and attractive we can make his surroundings, the more rapid and thorough will be his progress and cure. If it is true that the chief value of the sanatoria is educational, then the nearer it approaches the ideal home condition, the greater, more impressive and lasting will be its teaching.

We have found in our work where there is a blending of all classes (as must inevitably be the case in such institutions) that the smaller the groups of patients the easier and more successful will be their administration, for society even under such circumstances where the "touch of nature" should "make all mankind kin" is bound eventually like water to find its own level, and hence the administration of large and heterogeneous groups of patients in close quarters becomes impracticable and undesirable. My limited space will not permit me to go into further details here as to the character and arrangements of the building we have found most desirable and satisfactory in our work in Maryland, but these will be gladly given to those interested.

Before leaving the subject of sanatoria, I wish to speak of one phase of this great problem which has given me much food for thought and study, and that is the question of occupation, mental and physical, for the patients during their enforced idleness of weeks or months while undergoing the cure.

I cannot imagine a more demoralizing influence than taking men and women whose days have been filled with useful work and breadwinning and condemning them to a life of idleness with absolutely nothing else to do than sunning themselves in easy chairs and dwelling upon their own physical ills and frailties. Work and useful occupation of all kinds is the greatest blessing next to health that can be vouchsafed a normal being in this earthly life of ours. Its spiritual as well as therapeutic value to every human being cannot be over estimated. A healthy mind craves for it and finds relief from much bodily and mental suffering through its benign influence. Those who would be content in a life of absolute idleness are fortunately few, and even these few would be better in every way if compelled to do something useful within their strength. I think we are making a very great mistake in not giving this all vital question at least as much care and consideration in the conduct of our sanatoria as the purely physical condition of our patients.

There is no truer saying than "Satan finds some mischief still for idle hands to do," for even if the adage is not taken literally idleness will turn the mind of the patient irresistibly upon his own ills and suffering and he will inevitably dwell upon and nurse these until the whole great world seems to him to center in his case. I cannot help but feel therefore that the average sanatorium as now conducted is a great school for the teaching of indolence to those who can least afford to practice it if indeed any of us can, and I urge upon my hearers to give this phase of our great problem the serious consideration its vital importance to the welfare of humanity warrants, for I believe that up to this time this feature of the problem has been sadly neglected.

The foregoing remarks logically bring us to the consideration of our final agency in this work.

The Farm Colony.

Fraught as this whole tuberculosis question is with great and grave problems there is none greater than the after-care of the arrested cases, for we must all admit that simply prolonging life in those whom we can never hope to restore

again to the world of workers, or make fit to earn their living, is to say the least so doubtful a charity that many truly humane and generously disposed persons have questioned its desirability.

It does perhaps seem a strange paradox that we gently put a hopelessly sick or crippled animal out of its misery on the score of humanity, and yet are bent on prolonging to the utmost the useless suffering of our hopeless sick. Yet such are the ethics of our age, and this is the condition we have to deal with, not as a theory but a concrete fact. We must therefore deem of the highest importance the after-care of the hundreds of arrested cases, men and women who, although temporarily endowed with a further lease of life through the ministrations of our hospitals and sanatoria, are not able through their physical disabilities to return to their accustomed avocations.

For such cases the farm colony must be provided where through light work in field and garden these patients can contribute their mite towards their own support as well as that of the patients in both hospital and sanatorium. Not only does this reduce the cost of the general maintenance of all of these institutions, but it restores the patient to the ranks of self respecting workers, thereby lessening their cares and sorrows as well as physical ills. In this great work we have scarcely passed the initial or experimental stage, and yet we already see great therapeutic, spiritual, and material benefits resulting. We have patients at work a few hours each day on our farm colony who never expected to leave their beds again, and largely as a result of their labor our cost of maintenance per diem in this chain of institutions—and our patients live well—has fallen far below that of any similar institution in our country, of which we have the records.

The farm colony should be located in immediate proximity to the hospital and sanatorium so as to bring it under the same general management. To carry out its purpose it must of course have a large tract of arable land at its disposal for raising hay and other fodder, fruits, vegetables, flowers and garden stuff. On this farm colony should be located a dairy of sufficient size to furnish all of the milk required by these various institutions, and chickens and poultry raising adds another excellent and profitable branch of industry within the scope of the labor available.

In a farm colony of this kind once fairly established and in full working order, sufficient work can be done to make any number of patients practically self supporting, indeed I believe that it may be possible under the most favorable conditions, and by the addition of some other light industries to make the care of the patients return some profit, at least enough to render the payment to them of small wages a possibility.

This whole comprehensive plan for the treatment of the tuberculosis problem, I am happy to say, is not entirely a theory or yet a Utopian dream, but to a large extent an accomplished fact.

It is perhaps too soon to say what the future of our ambitious plan may be or whether or not we will be able to fully encompass the high ideals we have set ourselves, but when I tell you that we have each and every one of those integral parts of the proposed system in co-ordination and harmonious work under one management in our State of Maryland, and that this has been accomplished mainly within the last three years by the aid of an awakened public, competent managers and a resident physician, Dr. Alexius M. Forster, who has consecrated his life to its success, you will grant me that this "comprehensive plan" I have outlined is fraught with great possibilities for suffering humanity.

Note.—Since this article was written my attention has been called to the fact that the proposed combination of forces has been in successful operation at the Victoria Hospital, Edinburgh, for some time past, and that the credit for the first practical application, if not origination, of such comprehensive treatment of the problem belongs to Dr. R. W. Philip.

THE AXILLARY DIASTOLIC MURMUR IN AORTIC INSUFFICIENCY.

By Rufus Cole, M. D.,
Associate in Medicine, The Johns Hopkins University and Hospital.
and
Arthur Bond Cecil, A. B.

The exact situation at which the basal diastolic murmur of aortic insufficiency is usually heard with its greatest intensity has caused much discussion among observers. The area over which it is transmitted, and the situations where it is heard with increased intensity have been less discussed. The following paper deals mainly with these latter questions.

The area of maximum intensity has been described by various observers as being at the aortic area, over the sternum itself, along the left sternal margin, or even at the ensiform. From these conflicting views it is evident that the point of maximum intensity is not constant, but varies under different conditions. Most authorities, however, agree in considering that the murmur is usually best heard to the left of the sternum, in the third or fourth interspace at the sternal margin. Most writers state that it is transmitted downward along the sternum towards the ensiform; a few mention that it may be transmitted to the apex, occasionally heard in the axilla. Osler in the last edition of his text-book states that "in some cases it is loudly transmitted to the axilla at the level of the fourth interspace, not by way of the apex." In Osler's Modern Medicine (Philadelphia and New York, 1908), in the article on Diseases of the Circulatory System,

by Osler and Gibson, note is made of the variability of the point of maximum intensity, but no mention is made of its transmission to the apex or into the axilla. Babcock states that "this murmur is transmitted downward toward the ensiform appendix, and in some instances also toward the left, even as far as the apex."

Much attention has been given to the apical murmur in aortic insufficiency, which is presystolic in time, and has the characteristics of the mitral stenotic murmur, and so differs materially from the blowing murmur of aortic insufficiency. This murmur was first described by Flint, and has since been called the Flint murmur. Interest in it has drawn attention away from another fact, namely, that the blowing, aortic diastolic murmur may be transmitted to the apex or even to the axilla. Foster (Clinical Medicine, Philadelphia, 1874) early recognized that at times the murmur of aortic insufficiency might be heard distinctly at the apex, "equally, if not more so than over the ensiform." He observed this in several cases, in which post-mortem examination showed a lesion of the posterior cups of the aortic valve, and from this he concluded that the transmission of the aortic murmur to the apex in certain cases, "depends on the regurgitation taking place through incompetency of the posterior aortic segment, either at its right angle, or through perforation of its curtain."

He thought that this transmission of the murmur to the apex not only enabled one to decide as to the exact nature of the valvular involvement, but also was of prognostic significance. The posterior segment having no coronary vessel opening above it, a lesion involving this segment alone would not have so much effect in disturbing the coronary circulation as though the lesion involved the other segments, above which the coronary vessels open. Both theoretically and from his observation of cases, therefore, he concluded that the prognosis was less serious where the murmur was transmitted to the apex. Very little attention has been given to his observations, and his conclusions, as regards prognosis at least, have not been confirmed. It is altogether probable that the fact that he began to base theories upon observations, which in themselves were correct, caused the observations themselves to be disregarded and discredited. He distinctly states that the murmur he described "though diastolic in time, differed from a diastolic mitral murmur *in diminishing instead of increasing in intensity up to the first sound.* This character enabled me at the time to diagnose it as an aortic diastolic murmur transmitted to the apex; and to disregard the hypothesis, that it was due to mitral stenosis." It is, therefore, quite evident that he was not discussing the rumbling, presystolic murmur at the apex previously described by Flint.

Opinions differ very greatly in regard to the frequency with which the Flint murmur is present in cases of aortic insufficiency. Many of the German observers doubt its occurrence, and so good an observer as Gibson states in his text-book that he has never yet been able to demonstrate it. On the other hand it is being recognized frequently by the staff of the Johns Hopkins Hospital, and Thayer,[1] in a study of fatal cases of aortic insufficiency, states that in 74 cases coming to necropsy at the Johns Hopkins Hospital, a murmur of mitral stenosis was heard at the apex some time during the observation of the patient in 45, or 60.8 per cent of the cases. In 33 of these cases no stenosis of the mitral valve could be demonstrated. We ourselves are quite familiar with the Flint murmur, and the one we are describing is quite distinct from this murmur (or that of a true mitral stenosis).

The Flint murmur has all the characteristics of that occurring in true mitral stenosis, being rumbling and echoing usually presystolic in time, limited to the region of the apex, and usually ending in a sharp first sound, and so differing from the prolonged, blowing diastolic murmur heard in aortic insufficiency.

The attention of one of us was directed to the fact that the murmur of aortic insufficiency might be distributed widely throughout the axilla, when on several occasions in the hospital wards, notes were made on the histories of cases of aortic insufficiency that "there is present at the apex a prolonged, blowing systolic murmur transmitted into the axilla;" but upon accurate study these murmurs were found to be not systolic, but diastolic in time, and of exactly the same character as the diastolic murmur heard at the base. These murmurs, however, were not directly transmitted from the base, that is, they were not heard less and less distinctly as one passed outward from the point of maximum intensity into the axilla, but they were heard quite loudly outside of the apex, grew fainter as one passed inward, and then increased in intensity as the sternum was approached. Afterwards one of us had a patient under observation, in whom there was heard, on admission to the hospital, only a soft, prolonged diastolic murmur at the apex and in the axilla, while at the base and over the body of the heart no murmurs were audible. Later, following rest in bed, there developed a typical aortic diastolic murmur along the left margin of the sternum. All the other features of aortic insufficiency were present, and in this case a diagnosis of aortic insufficiency was made, notwithstanding the peculiarity of the aortic murmur on admission. In another patient the murmur in the axilla remained constant, while during the period of observation no murmur ever appeared in the usual situation. In this case also, the other features made the diagnosis of aortic insufficiency necessary. Thus having our attention drawn to the localization of an aortic diastolic murmur in the axilla we began to pay special attention to the occurrence of this murmur, and decided to make an accurate study of the distribution of the diastolic murmur in a number of cases of aortic insufficiency.

The cases studied have all shown well-marked features of insufficiency of the aortic valves. The method of study has been to place the patient in an upright position, or, if confined to bed, to place him in a semi-recumbent posture, as near upright as possible. The area of deep cardiac dulness has been outlined by percussion, and the boundaries have been marked with a pencil on the chest wall. Then the area over which the aortic diastolic murmur has been heard with greatest intensity

[1] Am. J. M. Sc. Phila., 1901, CXXII, 538.

has been indicated by eross lines, and the area over which it is transmitted has been carefully determined by passing outward from this point of maximum intensity in all directions, and the ontermost limits, where the murmur is just audible, have been indicated by dotted lines. Where there is an area of secondary intensity in the axilla, this also has been indicated by cross lines. Photographs were then taken of a number of these patients showing the areas above mentioned. We have found diagrams very unsatisfaetory for such purposes, as chest walls differ so much in size and shape, and diagrams and measurements alone give a very imperfect idea of the conditions present.

Case I.—J. G. Disp. No. 22,204 E. Black; age, 64; sailor.

Diagnosis.—Aortic insufficiency, dilatation (aneurysm?) of thoracic aorta, arterio-sclerosis, emphysema, chronic nephritis.

This patient was admitted complaining of shortness of breath and indigestion.

He has never had acute rheumatic fever. He has been a regular, but moderate, drinker, usually taking gin.

His main symptom has been shortness of breath, which is increased with muscular exertion. This interferes with his work, and it is for this reason that he comes to the hospital. He has also had some distress after eating. He has had no pain in his chest, and no acute symptoms of broken compensation.

On examination he is found to be a moderately well-nourished man. There is a marked grade of arterio-sclerosis. The pulse is collapsing, vessels throbbing.

Examination of Heart.—The point of maximum impulse is in the VI interspace, 2.5 cm. outside the mammillary line. It is sharp and punctate. There is a well-marked pulsation in the I and II left interspaces in the parasternal line. The first left interspace shows some fullness as compared with the right.

On palpation at the base there is felt a quite well-marked diastolic shock, most marked in the II left interspace. The impulse at the apex is heaving; no thrill is felt.

Dulness extends 15 cm. to the left in the V interspace, 4.5 cm. to the right in the IV interspace. There is a definite impairment of resonance over the sternum, as shown in the diagram.

On auscultation at the apex both sounds are well heard. The first sound is rather loud and is clear at present. The second sound is louder than the first. At the point of maximum impulse, and in a limited area just about it and below it, the area measuring not more than 4 cm. in diameter, there is heard a fairly well-marked rumbling murmur, presystolic in time, crescendo, ending in the first sound, therefore having the characters of the mitral diastolic murmur, and probably being a Flint murmur. But, in addition to this, there is heard a well-marked prolonged diastolic blowing murmur, quite distinct and different from the presystolic rumble previously mentioned. This has a much wider distribution than the rumbling murmur, the area over which it is audible being indicated by the dotted line in the diagram. In the VI interspace, 5 cm. outside the point of maximum impulse, the murmur is heard quite loudly, and it is heard with diminishing intensity as one passes away from this point in all directions. The murmur is prolonged, extending throughout the entire diastole, is blowing in character, and has all the characteristics of an aortic diastolic murmur. It may be traced inward, and is found to be continuous and identical with the aortic diastolic murmur heard at the base. As one passes inward, however, the murmur becomes fainter, and in the nipple line is just audible, but its intensity increases as one approaches the sternum. It is heard loudly at the sternal junction of the fourth left rib, but with greatest intensity in the II right interspace, where it is very loud and booming. Passing outward from this point in all directions the murmur diminishes in intensity.

This case shows an aortic diastolie murmur, loudest in the II right interspace, heard as high as the clavicles, as low as the ensiform, over the body of the heart, and in the lower axilla. It is of special interest that in the VI interspace, 5 cm. outside the point of maximum impulse, this murmur is heard quite loudly, louder than it is immediately inside of this point. There is thus an area of transmission of the murmur from the point of greatest intensity, and a second area of transmission of the murmur from the point of secondary intensity in the axilla. This case also shows a fairly well-marked Flint murmur.

Case II.—C. T. Gen. No. 63,459. Med. No. 22,485. Black; age, 45; occupation, porter.

Diagnosis.—Aortic and mitral insufficiency.

This patient was admitted complaining of shortness of breath and dropsy.

He has been a very hard worker, and has a marked alcoholic history. He has had no acute illnesses, no acute rheumatic fever or chorea.

The symptoms of which he now complains first appeared one year ago, and followed exposure. At present there is considerable general œdema. His vessels are quite markedly sclerosed. The pulse has a collapsing character.

Examination of Heart.—The point of maximum impulse is in the VI interspace, 13 cm. from midsternal line. The impulse is wavy. No thrill is felt at apex or base.

Cardiac dulness extends 13.5 cm. to the right in the IV interspace, to the left as shown in the diagram. On auscultation at the apex the first sound is faint, is almost entirely replaced by a rough scratching murmur. The entire diastole is occupied by a rough murmur, slightly rumbling at the apex, but not crescendo. This murmur is heard over the entire left front of chest, but is more blowing everywhere than it is just at the apex. The murmur is heard with maximum intensity in the II and III left interspaces close to the sternum. Here it is very loud, harsh and prolonged. It is loudly transmitted downward along the left margin of the sternum. Passing outward toward the nipple, however, the murmur becomes fainter and then again increases in intensity until one reaches a point in the V interspace about 3 cm. outside the mammillary line. Here the murmur is again heard with marked intensity. It is a question whether the intensity of the murmur is not greater here than anywhere else, even greater than in the III interspace at the sternal margin. The murmur here has not the rumbling character heard at the apex. It is transmitted throughout the entire axilla, the murmur diminishing in all directions as one passes away from the point above mentioned.

This case shows an aortic insufficiency murmur widely transmitted, showing two areas of great intensity, the first in the III interspace at the sternal margin, and the second in the V interspace, 3-5 em. outside the nipple line. At these two points the murmur is of almost equal intensity. At the apex the murmur has a more rumbling character, but it is questionable whether one should speak of this as a true Flint murmur.

Case III.—R. D. Gen. No. 63,244. Med. No. 22,419. White; age 16; occupation, laborer.

Diagnosis.—Acute rheumatic fever, aortic and mitral insufficiency, mitral stenosis.

The patient gives a history of recurring attacks of acute rheumatic fever since five years of age. He has had some shortness

of breath on exertion ever since the first attack. At the time of examination he is recovering from an acute attack of rheumatic fever, and the temperature is still elevated. There has been no pain in the joints for the past six days. He is still anæmic and looks rather ill, but is comfortable at present. The pulse shows a well-marked collapsing character.

Examination of Heart.—The point of maximum impulse is in the V interspace, 8 cm. from midsternal line.

The impulse is forcible, rather heaving, not punctate. There is no thrill, no diastolic shock at the apex or base.

The cardiac dulness extends 10 cm. to the left in the V interspace, 5 cm. to the right in the IV interspace, and above to the third rib.

On auscultation at the apex the first sound is replaced by a blowing systolic murmur of moderate intensity, which is transmitted outward into the mid-axilla. There is also heard a rumbling murmur extending throughout the entire diastole. The second sound is not audible. Passing inward, one begins to hear a blowing diastolic murmur, the rough rumbling diastolic murmur becoming inaudible. The blowing murmur increases in intensity as one passes inward until the point of maximum intensity is reached over the midsternum at the level of the third rib and III interspace. The murmur is also audible over the entire right front of the chest, being quite loud at the right sternal margin in the I and II interspaces. The murmur is heard loudly as one passes outward along the upper margin of the heart as far as the parasternal line, but outside this becomes fainter until one reaches the anterior axillary line, 4 cm. outside the nipple. Here the blowing diastolic murmur is again heard with great intensity, almost as loud, if not quite as loud, as in the area of maximum intensity above noted. It quickly becomes faint and disappears as one passes outward and downward. In the axilla it has none of the rumbling character which characterizes the diastolic murmur heard about the nipple over the area shown by the continuous line in the photograph.

This case shows a very widely distributed murmur of aortic insufficiency with the area of maximum intensity over the sternum, but with a second area of great intensity 4 cm. outside the nipple. The murmur at and inside the point of maximum impulse has a more rumbling character, but is prolonged throughout the entire diastole, is not crescendo, and does not end in a sharp first sound, and there is no thrill. It has exactly the time of the aortic diastolic murmur, and it is questionable whether the rumbling character is due to a narrowing of the mitral orifice.

Case IV.—M. P. Gen. No. 66,628. Med. No. 22,547. Disp. No. 22,421 E. White; age, 43; occupation, clothes presser.

Diagnosis.—Aortic and mitral insufficiency, mitral stenosis.

This patient has not been a very hard worker, and has taken alcohol only in moderation. There is no history of syphilis or gonorrhœa. He has had some indefinite joint pains, but no attacks of acute rheumatic fever.

Five months before admission he began to suffer from weakness and shortness of breath on exertion. He has had at times some precordial pain, and he has had some cough.

On examination he is found to be a moderately well-nourished man, very neurotic, and having some shortness of breath, but the symptoms of broken compensation at present are not marked. The vessels are sclerosed and thickened. The pulse is collapsing.

Examination of Heart.—The point of maximum impulse is in the VI interspace, 12.5 cm. from the mid-sternal line.

On auscultation at the apex there is heard a loud systolic murmur well transmitted to the mid-axilla. At the apex, and over a small area just about it, there is heard a well-marked presystolic murmur having the characteristic features of the murmur of mitral stenosis. Over the body of the heart there is heard a prolonged blowing diastolic murmur heard with maximum intensity along the left sternal margin. The murmur is transmitted outward into the axilla over the area indicated by dotted lines in the diagram. Passing outward from the sternum, however, the murmur becomes fainter and fainter as one passes into the axilla, and nowhere about the apex or in the axilla is there a point where the murmur is heard with greater intensity.

This case shows the aortic diastolic murmur transmitted to the axilla with no point of greater intensity outside the mammillary line. The other features of the case renders it probable that the presystolic murmur heard at the apex is due to a true narrowing of the mitral orifice and is not a Flint murmur.

Case V.—J. F. Gen. No. 64,395. Med. No. 22,808. Black; age. 38; occupation, laborer.

Diagnosis.—Aortic and mitral insufficiency.

This patient gives a history of acute rheumatic fever nine years ago, the illness lasting four and a half months. He had gonorrhœa eight years ago; no history of syphilis. There is a history of some alcoholic excess, and he has been a very hard worker.

On examination he is found to be a very muscular, well-developed man. The vessels are moderately thickened, the pulse is collapsing.

Examination of Heart.—The point of maximum impulse is in the VI interspace, 14 cm. from the mid-sternal line.

No thrill is felt at the apex.

On auscultation at the apex there is heard a loud, musical, systolic murmur well transmitted into the axilla. At the apex and over a small area surrounding it there is heard a short, rumbling presystolic murmur ending in the first sound. At the base there is heard a very loud blowing diastolic murmur heard with greatest intensity at the sterno-articulation of the third left rib. It is quite widely transmitted, being audible over the entire area marked by the dotted line in the photograph, and, as indicated, it is well heard in the axilla, but is not audible just at the point of maximum impulse. The murmur in the axilla is directly transmitted outward from the base with diminishing intensity, and there is no area in the nipple over which the murmur is heard with less intensity, and there is no point in the axilla over which the murmur is heard with greater intensity.

In this case the murmur of aortic insufficiency is quite widely transmitted, being audible in the left axilla, but the murmur here is transmitted directly outward from the base. The other features of the case render it probable that in this case the presystolic murmur at the apex is due to a true mitral stenosis, but the absence of thrill and of a tapping first sound, as well as the character of the pulse, make it possible that this is merely a Flint murmur.

Case VI.—J. B. Gen. No. 63,724. Med. No. 22,578. White; age, 28; occupation, carpenter.

Diagnosis.—Aortic and mitral insufficiency, mitral stenosis.

This patient gives no history of acute rheumatic fever or chorea. He has had no acute illnesses. He had a venereal sore 15 years ago, but no history of secondaries can be obtained. He gives a marked alcoholic history.

At present this patient has no marked symptoms of broken compensation. He has shortness of breath on exertion. There is slight sclerosis of the radial artery.

Examination of Heart.—The point of maximum impulse is in the VI interspace, 14 cm. from the mid-sternal line. The dul-

ness extends 15 cm. to the left in the VI interspace and 4.5 cm. to the right in the IV interspace.

The impulse at the apex is rather diffuse and heaving. There is no definite thrill.

On auscultation at the point of maximum impulse, accompanying the first sound is a soft blowing murmur, and preceding it is a loud rumbling crescendo murmur. This is heard only in the region of the apex and just below it. The systolic murmur is transmitted as far outward as the mid-axilla. Passing inward the rumbling presystolic murmur becomes fainter, but one begins to hear a prolonged blowing murmur extending throughout the diastole, increasing in intensity as one approaches the sternum. It is heard loudly over the sternum, and reaches its maximum intensity in the II right interspace. It is heard faintly upward to the clavicles, as shown by the dotted line in the photograph. Passing outward to the left the murmur becomes fainter and fainter, and then increases in intensity until a point in the axilla is reached in the VI interspace, 3.5-5 cm. outside the point of maximum impulse. Here the murmur is again heard with great intensity, though not quite so loudly as it is in the II right interspace. The murmur becomes fainter as one passes in all directions from this point of great intensity in the axilla. This murmur, however, is directly continuous with the basal diastolic murmur, has exactly the same character, and occupies exactly the same time in the cardiac cycle.

This case shows very well the characteristic features of the axillary aortic diastolic murmur, which is quite distinct from the presystolic rumbling mitral murmur heard at the apex. The other features render it probable that in this case the presystolic rumbling murmur is due to a true mitral stenosis.

CASE VII.—L. R. Disp. No. 22,264 E; white; age, 16.

Diagnosis.—Aortic insufficiency, mitral stenosis and insufficiency.

This child gives a history of acute rheumatic fever seven years ago, followed by chorea. Since then she has had some dyspnœa when lying flat on her back and on exertion.

She is fairly well developed, but shows slight clubbing of the fingers.

Examination of Heart.—The point of maximum impulse is in the V interspace, 8.5 cm. from the mid-sternal line.

The impulse at the apex is forcible and heaving, and is preceded by a short, well-marked thrill. There is no diastolic thrill at the base.

The cardiac dulness extends 11 cm. to the left in the V interspace, 3.5 cm. to the right in the IV interspace, and above to the upper margin of the third rib.

On auscultation at the apex there is heard a very sharp, loud, pounding first sound, preceded by a short, rumbling, crescendo murmur. There is also heard a soft, blowing systolic murmur. At the apex no mid-diastolic murmur is audible, but as one passes inward a blowing prolonged diastolic murmur becomes audible, quite distinct and different from the rumbling presystolic murmur heard outside this point. The blowing diastolic murmur increases in intensity as one passes inward, and reaches its maximum at the left sternal margin in the III interspace. It is heard faintly as high up as the sterno-clavicular articulation, and as far to the right as the parasternal line at the third rib. In the aortic area there is also heard a soft blowing systolic murmur, transmitted upward to the sterno-clavicular articulation, but not well heard in the vessels of the neck. Passing from the sternum toward the left, the blowing diastolic murmur becomes fainter and fainter, and is almost inaudible in the mammillary line. It again increases in intensity, however, and about 5 cm. outside the mammillary line the murmur again becomes quite loud. From this area of greater intensity the murmur diminishes as one passes in all directions, but it is audible as high up as the apex of the axilla, and outward to the mid-axillary line.

This case also shows the wide distribution of the aortic diastolic murmur and the area of increased intensity in the axilla as shown in some of the previous cases.

CASE VIII.—H. S. White; occupation, laundryman.

Diagnosis.—Aortic insufficiency, mitral stenosis and insufficiency.

Examination of Heart.—The point of maximum impulse is in the IV interspace in the mammillary line, 11 cm. from mid-sternal line. The impulse is forcible, punctate.

On palpation over the apex the impulse is sharp and thudding, and there is a slight pre-systolic thrill.

The cardiac dulness extends 12.5 cm. to the left at the fifth rib, and 5 cm. to the right at the fourth rib.

On auscultation at the apex the first sound is sharp and snapping, and there is a loud pre-systolic rumbling murmur running up to and ending in the sharp first sound, having a crescendo character. Passing from the point of maximum impulse in all directions a distance only as great as the diameter of the bell of the stethoscope, the rumbling pre-systolic murmur is lost, and there becomes audible a blowing diastolic murmur heard throughout the whole of diastole. This blowing diastolic murmur is heard over the precordium, in the lower left axilla, and along the right margin of the sternum as high up as the I interspace, as shown by the dotted line in the photograph. This murmur, however, is everywhere very soft and faint except in the two areas about to be mentioned. At the sternal articulation of the fourth left rib, and over the IV interspace at the sternal margin the murmur is quite loud and blowing. Over the sternum and in the oartic area it is very faint. Passing to the left from the point of maximum impulse the murmur rapidly becomes much fainter and is barely audible over the body of the heart. Passing outward, however, it increases in intensity until a point is reached 3.5 cm. outside the point of maximum intensity, where the murmur is heard with greatest intensity, much louder than at the sternal margin. The murmur here has exactly the same quality and the same time as that at the sternal margin, and is directly continuous with it. It seems almost certain that this murmur is produced at the aortic valve, and is a true aortic diastolic murmur, even though it is heard with greater intensity in the axilla than it is at the sternal margin. The character of the pulse, which is markedly collapsing, also renders it quite certain that this patient is suffering from a true aortic insuffi ciency.

This case shows very well the axillary distribution of the aortic murmur, and shows that in certain cases the murmur may be more intense in the axilla than it is in the region of the sternum.

CASE IX.—H. B.

Diagnosis.—Aortic insufficiency and mitral insufficiency. Mitral stenosis (?).

Examination of the Heart.—The cardiac impulse is diffuse in the V. interspace, just outside the mammillary line.

The cardiac dulness extends to the nipple on the left, to the sternal margin on the right, and above to the second rib.

At the apex the impulse is sharp and forcible, and is preceded by a well-marked thrill. There is no diastolic thrill at the base.

On auscultation at the apex the first sound is loud and booming, is accompanied by a blowing murmur, which is transmitted into the axilla, and is preceded by a loud, rumbling crescendo

murmur, ending in a loud, sharp first sound. This rumbling presystolic murmur is transmitted outward as far as the anterior axillary line. No blowing diastolic murmur is heard in the axilla, but as one passes inward such a murmur becomes audible when the parasternal line is reached. This murmur is well heard over the sternum and in the aortic area, but is of greatest intensity at the left sternal margin at the level of the third rib. It is not transmitted widely to the right. In the aortic area there is also heard a soft blowing systolic murmur.

In this case there is no axillary distribution of the aortic diastolic murmur, the murmur being transmitted to the left only as far as the parasternal line.

Case X.—D. G. Gen. No. 60,219. Med. No. 21,423. White; age, 18; occupation, tailor.

Diagnosis.—Aortic insufficiency.

This patient gives a history of an attack of acute articular rheumatism eight years ago. Shortly after this he was examined at the Johns Hopkins Hospital Dispensary, and was found to have a blowing diastolic murmur at the base of his heart, best heard in the III left interspace. Since then he has had no symptoms referable to his heart. During the present admission he has suffered from scarlet fever from which he is now convalescent. He has also had an acute nephritis, acute arthritis, acute tonsillitis, and adenitis. From all these complications he is now convalescent.

At present he is suffering from no symptoms referable to his heart. The vessel wall of the radial is not palpable.

Examination of Heart.—The point of maximum impulse is in the V interspace, 9 cm. from the mid-sternal line. The dulness extends to this point on the left, and reaches 4.5 cm. to the right.

On auscultation the sounds at the apex are clear and sharp. Over the sternum, and extending to the left about 2 cm. outside the parasternal line, there is heard a blowing diastolic murmur with greatest intensity over the sternal articulation of the third left rib, and in the III left interspace at the sternal margin. It is transmitted upward only to the level of the second rib. No other murmurs are audible. Change of posture does not alter the distribution of the murmur except that when the patient is upright, it is heard a little lower, and a little farther to the left, than when he is in the recumbent position.

This patient showed a well-marked aortic diastolic murmur, which, however, was not transmitted to the apex or outside of it. He exhibited all the other features of aortic insufficiency, and had previously been treated in the hospital for broken compensation. At the time of examination, however, he was at work, and there were no signs of disturbed compensation except slight shortness of breath on exertion. This case does not show the axillary distribution of the aortic murmur, and there is no Flint murmur.

Case XI.—L. B. Gen. No. 61,257. Med. No. 21,742. Disp. No. 8791 E. Black; age, 51; occupation, tailor.

Diagnosis.—Aortic insufficiency.

This patient complains of "rheumatism and cough."

For the past four years he has had pain in the joints, but no acute attacks of acute rheumatic fever. He had gonorrhœa 20 years ago; he has taken alcohol in moderation.

He now complains of the pains in the joints, which have been present for four years. During the past three weeks he has had a cough.

Examination of Heart.—On auscultation at the apex the first sound is entirely replaced by a very soft blowing murmur, the second sound is much louder and accentuated, and on cursory examination it might very well be mistaken for the first sound, and the blowing murmur be considered as diastolic. The blowing systolic murmur is heard loudest in the IV interspace in the parasternal line, and is transmitted only a short distance outside the point of maximum impulse. At the base there is heard a prolonged blowing diastolic murmur, loud at the aortic area, most intense along the left margin of the sternum. It is heard faintly throughout the right side of the chest. The murmur is well transmitted outward along the left margin of the heart, and is heard throughout the entire left axilla as far as posterior axillary line. At the apex this diastolic murmur is not audible, and in the region of the nipple it is quite faint, but is louder in the axilla. Passing outward into the axilla in the II, III and IV interspaces, however, the murmur does not become fainter and then louder, but is heard with a gradually diminishing intensity.

In this case of pure aortic insufficiency the murmur is well heard in the axilla, but it seems to be a direct transmission along the left margin of the heart. There is no Flint murmur.

Case XII.—D. H. Gen. No. 62,274. Med. No. 22,098. Black; age, 37; occupation, laborer.

Diagnosis.—Aortic and mitral insufficiency.

This patient gives a history of acute rheumatic fever five years ago. He had syphilis five years ago; has been a hard worker, and a steady drinker. One year ago he began to have shortness of breath.

On examination there is very slight thickening of the vessel walls. While this is definite, it is thought that the cardiac lesion is probably of rheumatic origin.

Examination of Heart.—The point of maximum impulse is in the VI interspace, 13.5 cm. from mid-sternal line. There is ascites at present and the heart is pushed upward and to the left. The area of cardiac dulness is difficult to outline on account of the thick œdematous chest wall. The dulness extends, however, at least 6 cm. to the right of the mid-sternal line. There is no thrill. On auscultation at the apex both sounds are audible and with the first there is a loud rough systolic murmur, slightly musical in character, transmitted into the axilla. At the apex during the entire diastole there is a loud, rough, prolonged, slightly musical murmur. Passing inward the murmur is faint in the region of the nipple, but it again becomes louder, more intense, and of a musical character. It has very great intensity along the left margin of the sternum, where it has a distinct sawing character. Passing outward the murmur becomes fainter until the anterior axillary fold is reached. Here it again becomes loud and musical. In a small area, 6-7 cm. outside nipple, in anterior axillary line, over a small area hardly larger than the bell of the stethoscope, the diastolic murmur is of very great intensity, prolonged and musical in character, and the intensity diminishes as one passes from this point in all directions. The intensity of the murmur here is not quite so great as it is along the sternal margin, but the difference is not very great. At the sternal margin the murmur has more of a sawing character than it has in the axilla. It is heard faintly throughout the left back. There is no Flint murmur.

This case shows very well the axillary distribution of the murmur, and also the area of secondary intensity in the axilla.

Case XIII.—P. C. Disp. No. 19,992 E. White; age, 36 occupation, tailor.

Diagnosis.—Aortic insufficiency.

This patient gives no history of acute illness except measles when a child. There has been no acute rheumatic fever. The alcoholic history is negative; he denies all venereal infection.

He has had no cough, no dyspnœa on exertion. He has had some slight gastric disturbance, for which he comes to the dispensary seeking relief. The cardiac disturbance was discovered during the routine examination.

The patient is a well-nourished man; radial vessels not sclerosed, and the physical examination is negative except for the changes found in the heart.

Examination of Heart.—The point of maximum impulse cannot be seen or felt.

The area of cardiac dulness reaches 12 cm. to the left in the V interspace, and 4 cm. to the right in the IV interspace.

At the apex the sounds are best heard over the fifth rib just inside the mammillary line. The first sound is a little rough, accompanied by a short and faint systolic blowing murmur. The second sound is snapping. Passing inward and upward, a blowing diastolic murmur becomes audible, which has its maximum intensity in the IV left interspace at the sternal margin. Even here the murmur is soft and not of great intensity. Passing outward above the nipple the murmur becomes very faint, but is even here audible in the area indicated by dotted lines in the photograph, but it again becomes more intense in the axilla, and is heard over a wider area. In an area over the pectoral fold, 7-8 cm. from the nipple, the murmur is heard with greatest intensity, louder than it is at the sternal margin.

This case shows in a very striking way the axillary diastolic murmur which we have been describing. Here is seen the dumb-bell shape area of distribution, which is, however, much less typical than in the other cases. There are two areas of greater intensity, one at the sternal margin, and the other in the axilla, with the murmur decreasing in intensity as one passes from each of these points in all directions. No Flint murmur is present.

CASE XIV.—H. S. Gen. No. 63,562. Med. No. 22,524. White; age, 58; occupation, saloon-keeper.

Diagnosis.—Aortic and mitral insufficiency.

This patient gives a history of repeated attacks of gonorrhœa, the first one 38 years ago. There is a definite history of syphilis. He has taken alcohol in excess up to the past few years. There is no history of acute rheumatic fever.

At present he complains of shortness of breath and palpitation of his heart, and at times precordial pain, especially on exertion.

He is a moderately well-nourished man; no œdema of feet. There is marked thickening of the arterial walls. The pulse is collapsing.

Examination of Heart.—The point of maximum impulse is in the V interspace, 11.5 cm. from mid-sternal line. There is some precordial bulging, maximum over the third rib.

The transverse area of cardiac dulness measures 18 cm.

On auscultation at the apex the first sound is rather muffled and prolonged and accompanied by a soft systolic murmur. In the area about the apex, outlined by the dotted line, there is heard a soft, but distinct, prolonged, blowing diastolic murmur. It is not rumbling in character, except just at the point of maximum impulse, over an area not larger than the bell of the stethoscope, where it is a little rumbling and more crescendo in character. The murmur in the axilla is loudest in the VII interspace, 7 cm. outside the point of maximum impulse, as shown in the diagram. It is not widely transmitted throughout the axilla. Passing inward the diastolic murmur becomes inaudible, but is again heard over the wider area included by the larger dotted line on the photograph. The murmur over this entire region is quite soft and faint, except in the area shown by cross line in the I and II interspaces to the right of the sternal margin, where it is quite intense and loud. In this area there is also heard a loud systolic murmur, which, however, is not well transmitted into the vessels of the neck, and the character of the pulse does not indicate an oartic stenosis.

In this case the aortic diastolic murmur is everywhere quite soft, but nevertheless it is heard outside the apex, and here there is a small area where it is heard with secondary intensity. This murmur about the apex is not a direct transmission outward, that is, it cannot be traced directly into the basal murmur, but nevertheless it has exactly the same character, and is of the same time, and we feel that it must be due to the regurgitation of blood through the aortic orifice.

CASE XV.—R. R. Gen. No. 62,850. Med. No. 22,287. Black; age, 60; occupation, cook.

Diagnosis.—Aortic insufficiency; gout.

This patient gives a marked alcoholic history, and probable history of lues. He has had attacks of gout during the past year. There is no history of acute rheumatic fever.

He is a well-nourished man, at present having some dyspnœa. The radial vessels are moderately sclerosed.

Examination of Heart.—The point of maximum impulse is in the VI interspace, 13 cm. from the mid-sternal line.

The dulness reaches 3.5 cm. to the right over the fourth rib. There is also slight impairment of the percussion note over the manubrium, and in the I and II right interspaces.

On auscultation at the apex the first sound is well heard, and is accompanied by a soft systolic murmur. The second sound is well heard. There is barely audible here a very soft diastolic murmur, which is transmitted only over a limited area about the apex, as shown by the dotted line. This murmur is heard loudest just above and to the outer side of the point of maximum impulse. It is faint, but well heard, and is soft, prolonged, blowing, and has exactly the same character and time as has the diastolic murmur heard in the oartic area. Inside the point of maximum impulse and over the body of the heart this murmur is entirely inaudible until one approaches the border of the sternum. It becomes loudest in the II right interspace at the margin of the sternum, though even here it is quite faint and distant.

In this case the aortic diastolic murmur is faint but very distinct, and the other features of the case render it quite certain that the patient is suffering from insufficiency of the aortic valve. Notwithstanding the faintness of the murmur it is heard outside the apex, and there is a small area of secondary intensity as shown by the diagram. It might be objected that the murmur heard about the apex is a Flint murmur, but the murmur has none of the characteristics of that heard in mitral stenosis, and it is exactly like the murmur of aortic insufficiency heard at the base.

CASE XVI.—W. B. Disp. No. 23,423 E. White; age, 47; occupation, can-maker.

Diagnosis.—Aortic insufficiency.

This patient has been a hard worker, and has a marked alcoholic history; has usually taken beer. He gives a history of having had several attacks of gonorrhœa and syphilis 22 years ago.

The present illness began with cough and pain in the chest two months before admission to the hospital.

There is not a marked grade of cardiac incompetency. There is slight shortness of breath.

His vessels show a marked grade of sclerosis. The pulse is 80, regular, and there is considerable throbbing of the vessels, a well-marked Corrigan pulse.

Examination of Heart.—The point of maximum impulse is in the V interspace, 14 cm. to the left of the median line. The cardiac dulness extends 1.5 cm. outside this point, and reaches 3 cm. to the right in the IV interspace.

On auscultation at the apex the first sound is loud, and is accompanied by a slight, short, squeaking murmur. Preceding the first sound there is a short, rumbling murmur, crescendo in character, and ending in the first sound. Passing inward, this rumbling character disappears, and there is heard a blowing diastolic murmur extending through the entire diastole. This murmur is heard over the entire cardiac area, and is transmitted throughout the left side of the chest and axilla, as shown in the diagram. While it is heard continuously in passing from the sternum to the axilla, nevertheless, in a zone 3 to 4 cm. wide in the region of the nipple and about the point of maximum impulse it is heard extremely faintly—is barely audible. Outside this area in the axilla it again becomes louder, and is heard quite loudly, almost with maximum intensity, in the area shown by cross lines on the photograph. It is also heard loudly, slightly louder than in the above-mentioned area, in the aortic area, in the III interspace close to the sternum. The slight presystolic rumbling murmur (Flint) is heard only over a small area at the point of maximum impulse, and has an entirely different quality from the loud, prolonged, blowing diastolic murmur.

This case shows very well the axillary diastolic murmur with an area of secondary intensity in the axilla.

Case XVII.—J. K. Med. No. 21,386. Gen. No. 60,112. White; age, 22; occupation, painter.

Diagnosis.—Typhoid fever, psychosis, aortic insufficiency.

The patient gave no history of rheumatic fever or chorea. The venereal history is negative, as is also the alcoholic history. The patient was admitted early in an attack of typhoid fever, and the aortic insufficiency was discovered at the examination. The patient passed successfully through the fever, the only complication being a moderate psychosis. The following examination of the heart was made during convalescence.

Examination of Heart.—The point of maximum impulse is in the V interspace, 9 cm. from the mid-sternal line. The dulness does not extend outside this point, and reaches only to the right margin of the sternum.

On auscultation at the apex both sounds are well heard, loud and sharp. There is slight reduplication of the first sound. In the small area just about the point of maximum impulse, shown in the photograph by the continuous line, there is heard a well-marked, presystolic, rumbling murmur (Flint). There is also audible a very soft systolic murmur, which is transmitted outward to the anterior axillary line. At the base both sounds are well heard; there is slight accentuation of the pulmonic second sound. Over the areas indicated by the dotted lines there is heard a loud blowing diastolic murmur, extending throughout diastole, of maximum intensity over the area shown by cross lines in the diagram. This murmur is audible outside the apex, as indicated, but it is soft, and there is no spot of increased intensity. Here it has exactly the same character as that at the base and over the body of the heart, and has not at all the rumbling character of the pre-systolic murmur just about the point of maximum impulse.

This case shows very well the axillary transmission of the murmur, but there is no point of maximum or secondary intensity, as seen in some of the other cases. There is a well-marked Flint murmur.

These cases, we think, are sufficient to show the frequency with which the aortic diastolic murmur is transmitted to the axilla. They also show that at times the murmur may be heard over a small area in the axilla with secondary, or even maximum intensity. We have not attempted to make a statistical study, but desire only to call attention to the points which have been neglected or overlooked by writers on this subject.

The above cases are of both the arterio-sclerotic and endocarditic types. At least five of them are certainly not of infectious origin, but the cardiac lesion is simply a part of the general arterio-sclerotic process. There seems to be no difference in the distribution of the aortic murmur in the two types of cases, the murmur being heard in the axilla equally well in both.

In all but two of the seventeen cases the diastolic murmur has been heard outside the apex. Further studies may show that this slightly exceeds the real frequency, but we are convinced that the murmur is almost always audible in the axilla.

In eleven of the cases the murmur has been heard with increased intensity over an area outside the apex. In other words, passing to the left from the area of greatest intensity in the region of the sternum, the murmur diminishes in intensity and then, outside the apex or in the axilla, again becomes louder. In two cases (IX and XIII) the murmur was louder over this axillary area than it was at the sternal margin or in the aortic area. In Case III, also, the axillary murmur was almost, if not quite as loud, as it was at the base. In two cases (XIV and XV) there were two distinct areas over which the murmur was audible, and between which the murmur could not be traced.

The area outside the apex over which the murmur is heard with increased intensity is well shown in the photographs. It will be seen that in most instances this area is 3 to 4 cm. outside the point of maximum intensity, and usually in the interspace above it, though sometimes this area is over the same interspace, or even at a slightly lower level.

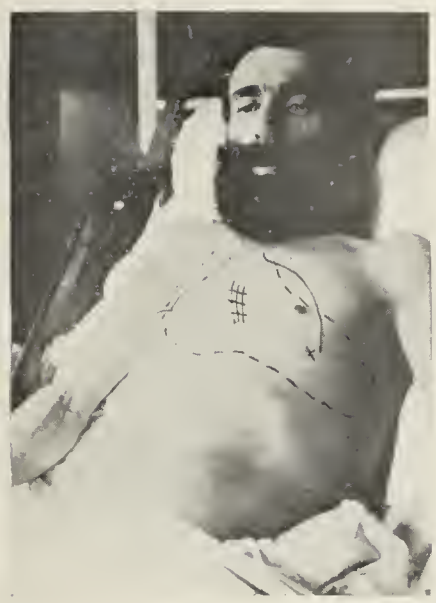
Corresponding to the findings of most other observers, the point of maximum intensity is most frequently at the left sternal margin (in nine of our cases). Five times it was at the right of the sternum, twice over the mid-sternum, and once, as mentioned, in the axilla.

In eleven of the cases there was a rumbling presystolic murmur heard at the apex, though in some it was very faint. In two a definite diagnosis of mitral stenosis could be made, and in five others the physical signs, history and general features rendered it probable that a true mitral stenosis was present, though in most of them the possibility that the murmur was only a Flint murmur could not be excluded. In four the presystolic rumbling murmur seemed to be quite definitely that described by Flint. In six, however, there was no suggestion of a rumbling presystolic murmur at the apex, but, nevertheless, the blowing aortic diastolic murmur was heard at and outside this point in all but one.

We foresee that the chief objection that will be raised to our description of the axillary aortic diastolic murmur will be that we have been listening to the diastolic mitral murmur (either a true stenotic murmur or a Flint murmur)

CASE 1.

CASE 3.

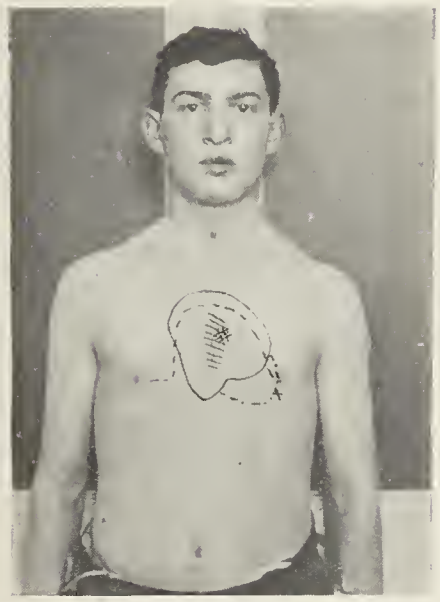


CASE 4.

CASE 5.

CASE 6.

CASE 8.



CASE 10.

CASE 13.

CASE 14.

CASE 15.

CASE 16.

CASE 17.

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which is transmitted into the axilla, or where we have described a diastolic murmur about the apex not directly continuous with the murmur at the base, that we have been listening to a Flint murmur which has been more than ordinarily blowing in character. We feel convinced, however, that such objections are not valid. The fact that the murmur described has been of exactly the same kind and quality as that heard at the base makes it seem almost certain that both have an identical origin. Moreover, these findings can be easily confirmed by any one who will carefully study and map out the distribution of the aortic diastolic murmur.

It is probable that the reason why so little attention has been paid to this murmur is that in many cases the diastolic murmur heard in the axilla has either been considered to be a Flint murmur, or even, where it has not been carefully observed, it has been considered to be systolic in time, as in the cases previously mentioned. We have no theories to offer as to why it should be louder at and outside the apex in certain cases than it is along the left sternal margin, though it is quite easy to understand why it should be fainter over the body of the heart. Whether, as Foster maintained, the aortic murmur is more likely to be transmitted to the apex in cases where the posterior aortic segment is involved than in cases where no such involvement is present, is very doubtful. We have had an opportunity to examine the hearts after death in two instances in which the axillary distribution and axillary intensification were present during life: In each of these the anterior cusps were involved, but the posterior cusp were quite normal.

In the present paper we have attempted to show that it is the rule rather than the exception that the diastolic murmur of aortic insufficiency is transmitted loudly to the axilla, and furthermore that it is not a transmission of the murmur towards the apex in the general acceptance of this statement, but that in most cases there is a second area of greater intensity above and outside the apex, and that while in many cases the murmur is heard continuously as one passes outward from the sternum to the axilla, becoming fainter and fainter, in other cases the murmur becomes inaudible in the region of the nipple, and is again heard in the axilla, or in rare cases the murmur may be entirely inaudible over the heart and at the base, and only be heard, at times at least, outside the apex. For this axillary diastolic murmur we would suggest the term *aortic axillary diastolic murmur.*

CERTAIN CLINICAL FEATURES OF CARDIAC DISEASE.[1]

By G. A. GIBSON, M. D., LL. D.

Physician to the Royal Infirmary, Edinburgh, Scotland.

Mr. President, Ladies and Gentlemen: Allow me in the first place to express the pleasure which has been afforded me in having the opportunity, through the kind invitation of my friend, Professor Barker, of meeting you on this occasion. To be requested to make any remarks upon cardiac disease before this society, the members of which have done so much admirable work upon many aspects of the circulation, in health as well as in disease, is indeed a distinction only mitigated by the feeling that it will be difficult to advance anything that is not already well known to you. The title which has been suggested for my address allows, however, a wide latitude of which advantage will be fully taken. The result will undoubtedly be that my remarks will be somewhat desultory, but they will be essentially clinical.

Let me direct your attention in the first place to some of the nervous features associated with that complex of symptoms which receives the name of angina pectoris. It is quite unnecessary to dwell upon the main circulatory disturbances, but it may be well to mention in passing that the arterial pressure may be high or low, and the heart and vessels may show very great, or extremely small, departures from normal conditions. The pain, which is the central fact in the nervous symptoms, is essentially of the variety which has been termed "referred" or "somatic." For its thorough comprehension we are mostly indebted to the observation of Mackenzie and Head, who have not merely traced out its distribution in a way previously unapproached, but have furnished an explanation as beautiful as it is complete. The main situation of the pain is in the region of the præcordia, whence it radiates towards the shoulder and down the arm, as well as, less frequently, up the side of the neck and head. In disease affecting the left side of the heart primarily, the pain is experienced mostly, or solely, on the left side; but, as has been shown by Morison and myself, when the structural changes are confined to the right side of the heart the painful symptoms are found in the corresponding areas. The changes in sensibility are found most typically along the course of the distribution of the ulnar nerve and its connections; that is to say, they correspond to the brachial roots connected with the seventh and eighth cervical segments, and the first thoracic segment, of the cord. One of the modern additions to our knowledge of these nervous symptoms was made by Mackenzie, when he directed attention to the fact that there is hyperæsthesia over the areas in which subjective pain is experienced. Careful analysis of the phenomena has since his observations were published, fully confirmed their accuracy. It has for some time been recognized that the numbness, which has for long been described by sufferers from the affection, is oftentimes attended by diminution of sensibility, which may reach such a degree as to attain complete anæsthesia.

The explanation of these phenomena, which has been given

[1] An address delivered before The Johns Hopkins Hospital Medical Society, October 1, 1908.

by Head is most interesting. The sensory impulses arising in connection with the heart or aorta pass to the central nervous system by means of the afferent cardiac nerves to the ganglia of the sympathetic system, particularly the middle and inferior ganglia, as well as the stellate ganglion, whence they are transmitted by the rami communicantes to the spinal cord. The impulses pass thence up the cord to the receptive areas of the brain, but as these, by the course of education, have been taught to associate disturbances in the spinal region which is affected with those areas of the surface of the body with which the sensory spinal nerves are in relation, the source of the disturbance comes to be associated with the nerves going to these superficial areas. Hence it is that the pain in angina pectoris centers so largely in the ulnar distribution. The explanation of the anæsthesia is, undoubtedly, that long-continued over-use of any nervous structure is apt to lead to exhaustion and paralysis.

It has been shown by Eichhorst and myself that wasting of the muscles, and changes in the texture of the skin are to be made out at times in the regions associated with the painful symptoms. It has, further, been demonstrated by myself that when muscular atrophy is found the myotatic irritability may be increased, exactly as is the case in arthritic muscular atrophy, while the electric reactions show a distinct increase, both as regards faradism and galvanism.

The eyes occasionally show alterations, to which it is my wish to direct your attention. The eye on the side to which the pain is mainly, or entirely, confined, may be more prominent than its fellow; while the aperture between the eyelids may be increased in width, and the pupil may at the same time be dilated. The explanation of these symptoms is very simple. If there be sufficient stimulation of the sympathetic system to reach the first cervical ganglion, the impulses may pass from it to the nervous filaments which control the muscle of Müller at the back of the orbit, to those which innervate the unstriped fibers of the levator palpebræ superioris, and to those which cause contraction of the radiating fibers of the iris. In this way protrusion of the eyeball, elevation of the upper lid, and dilatation of the pupil result.

These varying changes may be found in varying degrees, more or less of them being associated in any given case; at times many, or even all of them, may be present in the same individual, and in order to illustrate these remarks, let me refer very briefly to a most interesting patient who was under my care a few years ago, when Dr. H. A. Stewart, who is at present attached to this medical school, was my house physician. The patient was a man of middle age, engaged in the hard work of an unskilled laborer, who came into my ward complaining of agonizing pain in the breast and left arm. He was found to have no evil hereditary tendencies, while his past history showed no specific disease of any kind. His habits as to alcohol and tobacco did not seem to merit reprobation. He had been attacked quite suddenly by the symptoms when on his way to work one morning, and has been compelled to desist from making any further attempts at exertion. The patient presented a healthy appearance with a fresh complexion, but an anxious expression. Inspection of the face showed dilatation of the left pupil, prominence of the left eye, and increased width of the aperture between the lids. The conjunctival reflex was lively in both eyes and the iris rsponded promptly on both sides, both to light and to distance, the left pupil always remaining larger than the right. The pain was distributed over a wide area, extending over a great part of the left half of the chest, and up to the lower part of the neck from the middle line in front to that behind. As regards the arm, there was no pain over the distribution of the ulnar nerve, but it involved all the rest of the left arm down to the wrist. Over the whole of this area there was a high degree of hyperæsthesia; at the wrist there was a region about an inch broad encircling the limb with the exception of the ulnar area; this area was insensitive to painful impressions, but the patient could feel perfectly well when he was touched. Below this, with the exception of the region supplied by the ulnar nerve, every form of sensibility was completely abolished. In this case, therefore, on the outer aspect there was subjective pain and objective tenderness as far as the wrist, while at and below it, there was, firstly, analgesia without anæsthesia, and still lower, both analgesia and anæsthesia.

The left arm and forearm were somewhat smaller than those on the right side, and their power was notably diminished. The grip of the left hand was less than half that of the right. The muscle and tendon responses were, on the other hand, considerably greater in the left than in the right arm; and both to faradism and to galvanism, the muscles responded with a very much smaller current than in the case of the right arm. We could not, in this case, be certain that there was any alteration in the nutrition of the skin.

There was a certain degree of thickening of the superficial arteries, and the arterial pressure was high; unless my memory plays me false, it was, on admission, about 200 millimeters of mercury. During the paroxysms of the pain it appeared to be even higher, but for obvious reasons it was not specially measured at such times. When Dr. Stewart was engaged one day taking some tracings with the sphygmograph, an attack appeared, and the curve, which had shown the ordinary features of a somewhat high-pressure pulse, at once became much smaller in amplitude with its tidal wave higher up on the descending limb; in other words, it was a tracing of a pulse of higher pressure than before. The administration of nitrite of amyl promptly relieved the patient (as it always did during an attack), and brought about a return of the pulse to lower pressure. The heart was slightly enlarged, and the aortic second sound was considerably increased in intensity, but there were no other objective evidences of cardiac disease.

The ocular phenomena can be clearly seen in the pictures thrown on the screen, while the sensory disturbances which were traced upon the surface of the patient (who was afterwards photographed), have also been shown along with photographs of the pulse tracings.

It is satisfactory to be able to state that by means of the nitrites and iodides the patient made an excellent recovery. For some slight ailment he presented himself in my ward during the present summer, and we were able to assure ourselves of this fact.

Disturbances of the rate and rhythm of the heart have during the last few years furnished a fertile field for discussion. It is obviously too large to enter upon fully on the present occasion, but there are some aspects of the subject to which you will, perhaps, allow me to direct your attention. Before entering upon any discussion of the clinical bearings of such disturbances it is necessary to turn briefly to the mechanism involved. The researches of Gaskell upon the connections of the auricle and ventricle, in which he was followed by a number of observers, showed the existence of the now well-known auriculo-ventricular bundle. The entire course and distribution of this interesting connecting link were unfolded by the indefatigable researches of Tawara, demonstrating that after passing down from the inter-auricular to the inter-ventricular septum, the branches of the bundle radiate outwards in every direction, and are continued as the Purkinje fibers which reach not merely the central portion of the long scroll of muscular tissue described by J.B. MacCallum, but also the musculi papillares. The later investigations of Keith have not merely amplified certain details of this arrangement of fibers, but have furnished an altogether new and most interesting addition to our knowledge. Keith has recently shown that at the junction of the sinus and auricle of the right heart there is a peculiar structure, consisting of undifferentiated muscular tissue containing a large number of nerve ganglia and nerve fibers.

Gaskell not only analyzed the functions of the heart wall, pointing out that it possessed rhythmicity, conductivity, excitability, contractility, and tonicity, but he showed that there was a natural block at the auriculo-ventricular junction—often since termed "Gaskell's bridge"—and he further brought the fact into prominence that this block could be increased by artificial means. His discovered that by section of the auriculo-ventricular bundle impulses could be partially or totally interrupted in their passage downwards. Erlanger, while attached to the Johns Hopkins University, introduced a most ingenious method of exerting pressure upon the bundle and discovered that every degree of block might be produced.

Bradycardia or abnormal infrequency of pulsation may be false or true; the former brought about simply by failure of some of the ventricular impulses to reach the periphery, so that the rate of the arterial pulse is less than that of the heart; the latter produced by infrequency of the heart itself. False bradycardia may be regarded simply as an expression of cardiac failure, and it is not my intention to deal with it on this occasion. True bradycardia may be total or partial; to the first group belong cases in which the entire heart, auricular as well as ventricular, participates in the reduced rate. Instances of pressure upon the vago-accessory fibers, of toxic influences affecting the nervous mechanism or the muscular structure, and degenerative changes affecting the heart wall are familiar instances in point. From the examination of the veins of the neck, of the peripheral arteries, and of the cardiac apex by the graphic method with simultaneous tracings, as well as by means of the fluorescent screen, we are able to determine that the auricles as well as the ventricles are involved in such cases. In the second group are instances in which only part of the heart is involved. Many observers have published cases illustrative of such conditions, and in their investigation we have been greatly assisted by the researches of Erlanger and Hirschfelder of your own school. The best known form of this type of disturbance is found in block at the auriculo-ventricular band in which tracings demonstrate the existence of auricular impulses which are not transmitted to the ventricles. This is also borne out by the results of auscultation, for the sounds produced by the auricles may be heard in the intervals between ventricular contraction. The use of the fluorescent screen further shows in such cases that the auricles contract without any following pulsation of the ventricles. It is a matter of much interest to see in such examples that the use of drugs, such as atropine, can influence the rate of the auricles without producing any effect on the ventricles. This ventricular bradycardia may be partial or complete. By the first of these terms a condition is defined in which some of the auricular impulses (usually every third one) pass to the ventricles and initiate corresponding contractions. The second phrase denotes the condition in which there is total dissociation of the movements of the auricles and ventricles, the two different levels of the heart each pursuing an independent rhythm of their own. The tracings which have been thrown on the screen amply demonstrate these different types. Let me add lastly in regard to this part of the subject that some of these tracings may be taken as proving that it is not always conductivity which is impaired, but that excitability may be lessened.

In this particular type of heart block, the localization of the lesion has been found in a considerable number of cases to lie in the auriculo-ventricular band. The first pathological evidence of this fact was furnished by Stengel of Philadelphia, but several others, almost immediately afterwards, were fortunate enough to meet with instances also. It is probable that ere long our information will be extended, and that we shall discover new facts which will more or less modify our views. A heart which was shown to me the other day by Professor Adami and Dr. Klotz, of Montreal, concerning which the entire facts will be published by Professor Martin, in whose care the patient was, will certainly, to some extent, reopen the questions involved.

It is probable that a block may take place higher up—at the sino-auricular junction. Hering, Wenckebach, and Hirschfelder have already expressed their belief in such a possibility, and one of the tracings which has just been shown, and which was previously published by Ritchie and myself, seems most easily explicable on the supposition that certain of the smaller waves which occur amongst, but do not accord with, the rhythm of the auricular impulses, are produced by

the sinus contraction. It is an interesting fact that the movements of the auricles in such cases are remarkably regular; when we find other waves appearing irregularly amongst them we must seek for some other cause, and this is most likely to be found in a pulsation of the sinus which has not been followed in the normal manner by the auricular systole.

An abnormal increase in the rate of pulsation commonly known in modern times as tachycardia may apparently be produced by neurotic, toxic, or degenerative influences, but our comprehension of the subject is not yet so advanced as in the case of the conditions which have already been discussed. From the tracings which have been shown, you will readily accept the statement that the increased rate is largely dependent upon the presence of premature systoles. Whether the origin of this change may be in part due to diminished influence of the inhibitory, or to increased activity of the accelerator nerves is uncertain, but we may assume in all such cases an increased production of the rhythmic stimulus at the sino-auricular junction of Keith, which must be regarded as the pace-maker for the whole heart, except in those cases where the impulses are blocked. There is, however, nothing now more certain than the fact that the ventricle may initiate a rhythm of its own, and one of the tracings which has just been brought before you shows most distinctly contractions of the ventricles in the total absence of all auricular movement.

Will you allow me, Mr. President, to express to you, as representing on this occasion the university, my great satisfaction in being permitted to witness the wonderful strides which you have made. Coming amongst you for the first time, the noble words which Huxley uttered at the opening of this great institution two decades ago naturally occur to my memory:

"Truly America has a great future before her; great in toil, in care, and in responsibility; great in true glory if she be guided in wisdom and righteousness; great in shame if she fail. I cannot understand why other nations should envy you, or be blind to the fact that it is for the highest interest of mankind that you should succeed; but the one condition of success, your sole safeguard, is the moral worth and intellectual clearness of the individual citizen. Education cannot give these, but it may cherish them and bring them to the front in whatever station of society they are to be found; and the universities ought to be, and may be, the fortresses of the higher life of the nation.

May the university which commences its practical activity tomorrow abundantly fulfil its high purpose; may its renown as a seat of true learning, a center of free inquiry, a focus of intellectual light, increase year by year, until men wander hither from all parts of the earth, as of old they sought Bologna, or Paris, or Oxford."

How abundantly those responsible for the administration of the university have fulfilled their trust, and how loyally those who have worked under their auspices have performed their duties, can be read by all in the important series of observations which have enriched modern scientific literature; but this is not all, for the free spirit of inquiry which you have shown has been wafted to all lands, and has awakened everywhere a sympathetic response. The hopes which Huxley so generously expressed have been far more than realized, and seekers after truth from many countries have directed their footsteps hitherwards. Amongst these have been some of my own particular friends, for your kindness to whom you will perhaps allow me to tender my warm acknowledgments. That the university may continue to foster the higher education and to increase its usefulness is the fervent hope of all your friends, amongst the warmest of whom, you will allow me to enroll myself.

THE PRACTICAL VALUE OF THE DEMONSTRATION OF *SPIROCHÆTA PALLIDA* IN THE EARLY DIAGNOSIS OF SYPHILIS.

By J. T. Geraghty, M. D.
Instructor in Genitourinary Surgery, The Johns Hopkins University.

It is over three years since Schaudinn and Hoffman first reported the finding of *Spirochæta pallida* in smears made from the primary and secondary lesions of syphilis. The announcement was very modest and made no exaggerated claims, simply stating that the writers had found in syphilitic lesions a spirochæta which was morphologically distinct from other forms. They also described another form of spirochæta which was non-pathogenic and sometimes resembled quite closely the *S. pallida,* and to this organism they gave the name *Spirochæta refringens.* This latter organism is important on account of its frequent occurrence in superficial ulcerations and its close resemblance at times to the syphilitic organism.

Since the first publication of the findings of Schaudinn and Hoffman an enormous amount of work has been done and the observations of the different workers have almost unanimously confirmed the findings of the discoverers of the organism. Although the *S. pallida* has so far not been definitely grown on artificial media, and consequently all of Koch's requisites have not been fulfilled, nevertheless the evidence in favor of its being the etiological agent in syphilis has so accumulated that it is generally accepted as such by those most competent to judge. The evidence may be briefly summed up as follows:

(1) The presence of the *S. pallida* and the absence of any other organism in the still-born, dead of heriditary lues. (2) The number of *S. pallida* corresponds to the extent of the disease in the syphilitic organ and their absence or scarcity in organs not diseased has been commonly noted by those who have investigated the matter. (3) The almost constant finding of the *S. pallida* in the primary lesions of man and monkeys. Schaudinn found it 70 times in his last 70 cases of

primary and secondary syphilis. Sobernheim in 50 cases of primary and secondary syphilis found the *S. pallida* in every case. Metchnikoff and Roux in their experimental work on apes found the *S. pallida* 23 times in 31 infected animals and they have never found any spirochætæ other than the *S. pallida* in their animal innoculations. Hoffman found the *S. pallida* 14 times in 14 chancres. Mulzer found it 20 times in 22 syphilitic cases, and learned of 32 chancres in which it had been found 30 times. Flügel found it 28 times in 29 chancres. Herxheimer and Hübner 16 times in 17 cases of primary and secondary syphilis. I have quoted at considerable length these authors and their positive findings in order to show in what a small percentage of cases of syphilis negative findings occur in the experience of skilled observers. (4) The fact that the *S. pallida* has never been found except in syphilis. (5) The finding of the organism in syphilis in the most distant countries. (6) The lesions which are the most contagious in acquired syphilis, the chancre, condyloma and mucous patch are the ones in which the *S. pallida* are the most numerous and most often found. (7) They have been found in all the lesions of syphilis, in the blood in the secondary stage and even in the urine in a case of syphilitic nephritis, etc. (8) Mercury, which is the only drug that can cure syphilis, causes the very rapid disappearance of the *S. pallida* from the local lesions.

In order to determine if the *S. pallida* could be demonstrated with sufficient ease in the primary sores to be of any practical value and whether it was possible to definitely distinguish it from the commonly associated non-pathogenic *S. refringens,* a systematic examination of all venereal sores in patients coming to the genitourinary dispensary of The Johns Hopkins Hospital was begun over a year ago.

Those who see many venereal sores realize that in a great number of cases it is impossible to distinguish between chancroid and chancre. The time element is seldom of any value so that the period of incubation cannot be determined. The syphilitic sore may be nothing more than a tiny abrasion lasting only a few days and no suspicion of its true character entertained until it is subsequently revealed by the development of secondaries. Again and again we have seen apparently typical chancroids which afterward proved to have been syphilitic sores.

The diagnosis was so uncertain in many cases that it became a routine measure in our clinic to wait for the development of secondaries. It is unjustifiable upon mere suspicion or probability to condemn a patient to three or more years of vigorous mercurial treatment while on the other hand it seems only rational that the specific treatment should be begun as early as possible. Experience has shown that those cases in which an early diagnosis could be made from the primary sore and in which treatment was begun before the appearance of secondary lesions ran generally a mild course and according to Fournier were much less liable to tertiary accidents.

During the past year we have searched for *S. pallida* in nearly all of the venereal sores of patients coming to the genitourinary dispensary. We have examined about 150 cases in all; of this number 30 were syphilitic—they either had definite secondaries when first seen or subsequently developed them. Other syphilitic lesions such as condylomata, mucous patches and secondary skin eruptions were also searched for organisms. Comparatively few examinations of tertiary lesions were made as very little of this material presented itself in the clinic. Smears from the syphilitic organs of the still-born fœtus were examined in three cases.

The technique employed has been as follows: The sore is thoroughly cleaned with soap and water, and the surface of the sore rubbed with a piece of gauze until small bleeding points appear. After the surface of the lesion has been scraped in the manner above described the sore is firmly compressed between the thumb and forefinger. This firm pressure causes at first quite an ooze of blood, but if pressure is kept up an almost clear serum will soon exude. A clean slide is then rapidly swept across the exuding serum—usually from three to four smears are made from each sore. We have found the above method of making the smears very satisfactory and almost uniformly successful. The most essential step in the search for the *S. pallida* is the making of good smears and success or failure will depend largely upon it. The sores are thoroughly cleaned in order to eliminate as far as possible a contamination with the *S. refringens,* which is a surface grower, while the *S. pallida,* being a true parasite, is most apt to be obtained from the serum which is squeezed out of the living tissue. The same technique is employed in making smears from condylomata and mucous patches on the lips. Where the mucous patches are situated on the inner cheek, tonsils or fauces satisfactory smears are obtained with difficulty.

In obtaining smears from the skin lesions the superficial epithelium should be scraped off with a knife-blade until small bleeding points are visible. The serum is then squeezed from the abraided surface and the smears are made in the same manner as those from the chancre. · When the skin lesion is a pustule the pus must be evacuated and the serum obtained as far as possible from the bleeding edge of the pustule. If an examination only is made of the pus or necrotic material it will be almost uniformly negative.

Similarly in searching for the organism in tertiary ulcers the importance of obtaining the material from the edge of the sore has been emphasized by Schaudinn himself.

Method of Staining.—In our earlier work the Giemsa stain was almost exclusively employed. The method of staining is as follows: The smears are first fixed in absolute alcohol for 20 minutes and are then ready for staining. We have found a dilution of one part of the stain to four of distilled water the most satisfactory. The slides are covered with this dilute stain (the dilution should be made fresh each time), a bell jar is placed over them to prevent evaporation and they are allowed to stain from 12 to 18 hours. It is difficult to overstain. The slides are then washed for a moment in running water, dried and are ready for examination. The *S. pallida* will be stained a pinkish tinge while the *S. refringens* takes a

deep blue. This differential staining, however, is not always absolute as occasionally blue staining *S. pallida* are encountered. Of late we have given up entirely the Giemsa stain and employed instead that of Hastings.

The method is as follows: The slides after being air-dried, are then covered completely with the stain, care being taken to keep the slides well covered with stain to prevent precipitation. After one minute distilled water is added until a metallic film forms and the smears are allowed to stain for five minutes more. They are then quickly washed in running water and dried. The *S. pallida* are usually stained a faint blue and occasionally have a pinkish tinge, while the *S. refringens* are stained a deep blue. The Hastings stain is to be preferred to the Giemsa as the method is simpler and the material can be stained in a few minutes. Furthermore, the staining is more intense with Hastings than with Giemsa. We have employed various silver staining methods, but have not found any of them as uniformly satisfactory as the Hastings. The principal objection to the silver method is the time which it consumes.

Our experience with the dark field illumination which enables one to see the organism in the fresh unstained serum is as yet too meager to permit comparison with the staining methods mentioned.

Differential Characteristics.—It may be well to enumerate some of the characters of the *S. pallida* which serve to distinguish it from the *S. refringens*. The *S. pallida* is extremely slender, of uniform caliber, except the ends which taper almost to an invisible point. The *S. refringens* is much thicker. The spirals vary in number from four to twenty or even more and the length of each spiral is about half the length of the spiral of the *S. refringens*. If the length of the spiral is two microns or over it is never a *S. pallida*. The spirals are fairly uniform, gradually and very slightly diminished in size from the center towards the end and are rather angular. The spirals of the *S. refringens* are more wool like. They are neither so uniform nor so numerous and are not so close set as are the spirals of the *S. pallida*. The *S. refringens* are readily stained by ordinary dyes.

Results.—A routine examination of all venereal sores of patients appearing in the clinic was undertaken. In all about 150 cases were examined and of this number 30 were syphilitic —they either had definite secondaries when first seen or subsequently developed them. In these 30 cases *S. pallida* were demonstrated in smears from the primary lesions in 27 cases. Every case in which the organism was demonstrated had definite syphillis when first seen or subsequently developed manifest symptoms. Specific treatment was not begun in many cases in which the organisms were found until definite evidence of the disease appeared, as we wished to test the reliability of our findings. In two of the three cases in which we failed to find the organism the sore had begun to heal. It has been our experience in other cases that where the primary lesion has begun to show signs of repair, it is frequently difficult to demonstrate the *S. pallida*. This of course is natural as the healing denotes the disappearance of the organisms from the lesion. In the third case, although numerous attempts were made to find the *S. pallida*, the results were always negative.

It is of some interest to note that in two preputial chancres in which the organism had been readily demonstrated it was impossible to find any organism in smears from the chancres 24 hours after they had been excised. The Giemsa stain was employed in staining the smears from the excised chancres. We have had a similar experience in smears made from the organs of three syphilitic fœtuses. Although a large number of slides were examined, in each case both the Giemsa and Hastings stain being used, it was impossible to demonstrate a single *S. pallida*. In one of these cases pieces of tissue from various organs were stained by the Leviditi silver method and the *S. pallida* found present in enormous numbers, although smears from the same organs were negative with the Hastings and Giemsa stains. This would indicate that the organisms present in the dead tissue quickly undergo changes which render them refractory to the ordinary staning methods.

In several cases spirochætæ wert found in sores which did not at all suggest chancres, but proved subsequently to be syphilitic. One patient presented himself a few days after the appearance of two innocent looking ulcers. *S. pallida* were demonstrated in both lesions and the sores healed in less than a week, but it was not until six weeks later that definite evidence of the disease appeared. Vigorous treatment was then begun, but his syphilis was rather stubborn and marked by frequent recurrence of mucous patches. I feel confident that had treatment been instituted when spirochætæ were first demonstrated, the subsequent course of the disease would have been much milder.

Another patient presented himself at the clinic for the treatment of a subacute urethritis and during the examination a small red area, not over 2 mm. in diameter was noted on the glans penis. The area was slightly raised above the surrounding skin, but the epithelium was intact and no induration made out. The patient had not noticed the area. The lesion resembled an ordinary macula and in no way suggested a primary syphilitic lesion. It disappeared entirely in about a week. Large numbers of *S. pallida* were found in the smears and the patient subsequently developed secondaries.

In the condylomata and mucous patches, but particularly the former, the *S. pallida* are usually present in enormous numbers. This corroborates the well-known infectiousness of these lesions.

Being somewhat curious as to whether the *S. pallida* could be demonstrated with any degree of ease in the secondary skin eruptions, a small series of cases was examined. We found them as a rule easily demonstrable in the large well-marked papules, not quite so numerous in the small papules and pustules, and found as a rule only after a long search in the macular lesions.

The results of our investigation show quite conclusively that the *S. pallida* can be found with comparative ease in the pri-

mary sores. We were able to demonstrate them in 90 per cent of our cases. Usually a few minutes was all that was necessary, provided good smears had been obtained, and it was but seldom that a search of more than fifteen minutes was required to find the organism. When one becomes familiar with the morphology of the *S. pallida* and with that of the *S. refringens,* the organism most likely to be confounded with the *S. pallida,* it is seldom that any difficulty is experienced in differentiating between the two.

In our genitourinary clinic smears are made from all venereal sores as a matter of routine and whenever the *S. pallida* is found specific treatment is begun at once. The presence of the *S. pallida* in the lesion is sufficiently positive to warrant the immediate institution of treatment.

THE CONTRAST IN THE EXCRETION OF CHLORINE IN INFLUENZA PNEUMONIA AND IN ORDINARY LOBAR PNEUMONIA.

By LEONARD GEORGE ROWNTREE, M. D.

(From the Medical Clinic of the Johns Hopkins Hospital.)

It has long been known that the excretion of chlorine varies markedly in different diseases. Two diseases, pneumonia and nephritis, have attracted particular attention in this regard. In pneumonia we frequently encounter complete retention, and much discussion has been evoked concerning its prognostic and diagnostic importance in this disease. Formerly it was thought to be of great prognostic value, and is still considered so by some authorities.

A marked retention usually occurs before the crisis in fevers, and immediately after this the excretion is greatly increased. Sahli considers this to be as important an indication of improvement as is the fall in temperature. Achard and Laubry have applied the term "chlorine-crisis" to this condition, but from later work we know that this increase in chlorine may occur before or during the fall in temperature, and often is the first indication of improvement in the pneumonia.

Sahli also attributes great diagnostic value to the excretion of chlorine, for he says: "A pronounced diminution or absence of chlorides in the urine in a febrile disorder will always suggest pneumonia." Certainly pneumonia exhibits a more marked and more constant retention than any other febrile disorder.

Musser and Norris in Osler's Modern Medicine give a very interesting table of the condition of the excretion of chlorides in 436 cases of pneumonia.

	Ashton and Landis.	Musser.	McCrea, Fyshe, Ainley.	Haddon, McKenzie, Ord.	Total.	Per cent.
Chlorides, normal.....	18	6	4	56	84	19.2
Do. decreased...	66	18	9	139	232	53.2
Do. absent.....	72	20	3	25	120	27.5

A second table of the Haddon, McKenzie, Ord group is given.

	Number of cases.	Number of deaths.	Per cent. of deaths.
Chlorides, absent.....	25	7	28
Do. diminished.....	139	22	15.8
Do. normal.....	56	7	12.5

Emerson has studied the records of 34 cases of pneumonia and gives the following interesting report:

Six of these cases had a crisis. The chlorides increased before, during, and after the fall in temperature in different cases.

Twenty-two were with lysis, in fourteen of which there was a drop in the chlorides towards the lysis. On the first day of the lysis in ten cases there was more than 1 gm.—average 2.6. gm. The excretion was lowest during the fall in one-third, and just before the temperature began to fall in two-thirds of the cases.

Five fatal cases showed a steady fall till death, except one which showed slight increase before death. One of these showed a complete retention for six days, when death supervened.

One case of delayed resolution did not show a marked decrease, the excretion varying from 5 to 10 gm. per day for three weeks.

Von Noorden says that only prolonged clinical experience can show whether the appearance of the retention of chlorine has a far-reaching significance as regards prognosis, or whether it is only indicative of a temporary condition. Be this as it may, the fact yet remains that we usually do have a marked retention in pneumonia, and this is generally considered to be of real diagnostic importance.

In health, the normal output of chlorine, estimated as sodium chloride, is 10 to 15 gm. per day, rarely more. The cause of this retention in pneumonia is difficult to explain. It is not due to the decrease in diet, as other diseases on a similar diet exhibit a much greater chlorine output. That it is a true retention has been demonstrated by repeated experiments in which large doses of sodium chloride have been given subcutaneously or by the mouth, without any increase in the excretion of chlorine as occurs in health under similar experiments.

Many theories have been advanced to explain this. Terray ascribes it to the retention of water. This in itself is insufficient.

Röhman says that it is due to the fact that the organ protein-poor in chloride becomes converted in the circulating fluid into protein-rich in chloride.

Von Limbeck, Schwarz and Hijmans claim that the elimination of chlorine is inversely proportional to that of phosphoric acid, and believe that chlorine retention occurs only when the osmotic equilibrium of the body juices has been disturbed, as a result of the increased phosphoric acid elimination. Retention thus preserves the isotonicity of the blood. This does not help us much as the elimination of phosphoric acid varies more than that of chlorine.

A fourth theory has been advanced, which is that in pneumonia the precipitation of albumen in the pulmonary exudate "ties up" large quantities of chlorides. This view is unsatisfactory, for Preble has shown that consolidated areas of lung show an average of 1.69% of sodium chloride, whereas normal lung shows 1.4%. The difference is too slight to account for the phenomenon. But while the proportion by weight is only slightly increased yet the total weight of the lobes involved is greatly increased, so that this will account for considerable retention. But the degree of retention does not bear any direct relation to the amount of consolidation, which also seems to disprove this theory.

Aufrecht believes that it is due to the fact that in fevers the products of catabolism are taken up by the circulation, but only a part of them are immediately transferred into their final products, the remainder being stored in the body by combining with the sodium chloride in the blood plasma.

Though these many theories are advanced, we are not yet certain of the real cause of the retention.

The chlorides of the saliva are relatively greatly increased, but the total daily output by this means is so small that it does not account for the diminution of chlorides in the urine.

The patients on whom the following observations were made were all suffering from lobar pneumonia clinically. In some of them the bacteriological examination of the sputum revealed the *B. influenzæ*. Cultures in these cases showed the *B. influenzæ* in pure or mixed growth, and when mixed cultures were obtained the *B. influenzæ* was the preponderating organism. During this time there was an epidemic of influenza in Baltimore. So in these cases we have assumed the *B. influenzæ* to be the probable etiological factor, and henceforth only refer to the condition as influenza pneumonia.

From a pathological point of view these cases are most frequently of the broncho-pneumonic type, but the process is often limited to one, two or three lobes; and macroscopically on superficial examination it often closely resembles certain stages of croupous pneumonia by the coalescing of contiguous areas of involved lung. Microscopically the exudate is strikingly rich in cellular elements and the fibrin is much less abundant than in croupous pneumonia.

The following observations were carried on in the Clinical Laboratory of the Johns Hopkins Hospital at the suggestion of Dr. Barker, who thought that the excretion of chlorine might differ in these two types of pneumonia.[1]

Total Output of Chlorine in Twenty-four Hours.—In lobar pneumonia this was very low; most of the readings were below 1 gm. Only two cases went above it; one only on the last reading, while the other case was higher throughout. Only two readings were above 3 gm. One patient had absolute retention, starting on the 14th of the month; on this day 10 gm. of sodium chloride were administered but retention continued absolute till the 18th, on which day 2 gm. were excreted. Patient died on the 19th. So here we see a marked retention throughout all our cases, and only on two readings did the output reach as high as the majority of low readings in the influenza pneumonia.

In influenza pneumonia the decrease was not nearly so marked. Only one reading was below 1 gm. Two cases showed a fair amount of retention—3 gm., and the one above referred to showed a marked retention on first reading. All three quickly rose to 5 gm. Then there was a more or less steady increase with increasing diet until an approximately normal daily output was reached. The other two cases were very different. One had a normal output throughout while the temperature was 103° F. When the temperature reached normal, the chloride output was greater than in health. At this point diarrhœa started and its effect on chloride excretion is nicely displayed, *e. g.*, a very marked fall in total chloride output, with a marked increase of chlorine in 10 ccm. of urine, and a marked diminution in the quantity of urine. The other case probably had some tubercular infection along with the influenza pneumonia. The output throughout was fair and reached normal at the time the patient was discharged.

The Amount of Chlorine Excreted in 10 ccm. Urine.—Taking 1400 ccm. as the normal daily quantity of urine and 12 gm. as the average normal daily sodium chloride output, the normal amount of $\frac{N}{10}$ $AgNO_3$ solution necessary to precipitate the chlorine in 10 ccm. of urine is 14 or 15 ccm. We have expressed the amount of chlorine in 10 ccm. of urine in terms of the number of cubic centimeters of $AgNO_3$ solution used because it is more easily charted as such. The number of cubic centimeters of $AgNO_3$ solution multiplied by .005837 gm. gives the amount of sodium chloride in 10 ccm. of urine.

In lobar pneumonia the number of cubic centimeters of $\frac{N}{10}$

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[1] The method of work was as follows: All those cases of pneumonia coming into the hospital in which the micro-organism etiologically concerned was undetermined were observed. After the organism was found to be other than the *B. influenzæ*, observations were *discontinued*, as we are already familiar with the excretion of chlorides in pneumonia due to the *B. pneumoniæ*.

The total daily quantity of urine was secured and the chlorides estimated. In all these estimations the Lütke Martins method was used and the results charted.

●——●——● represents the total output of chlorides for 24 hours.

□——□——□ represents the number of ccm. of $\frac{N}{10}$ $AgNO_3$ solution necessary to precipitate the chlorine in 10 ccm. of urine.

●—·●·—·● represents the total daily output of urine.

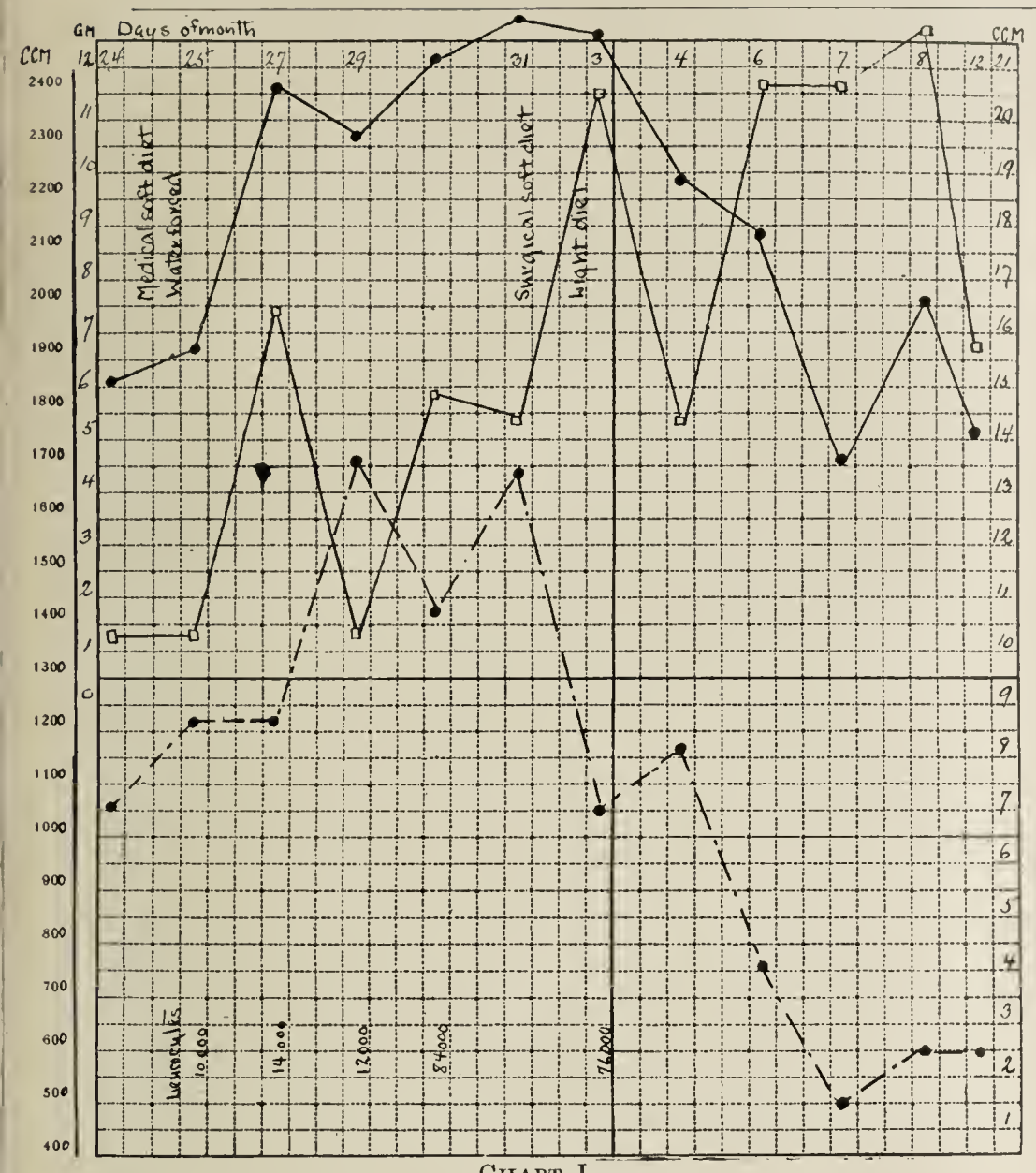

CHART I.

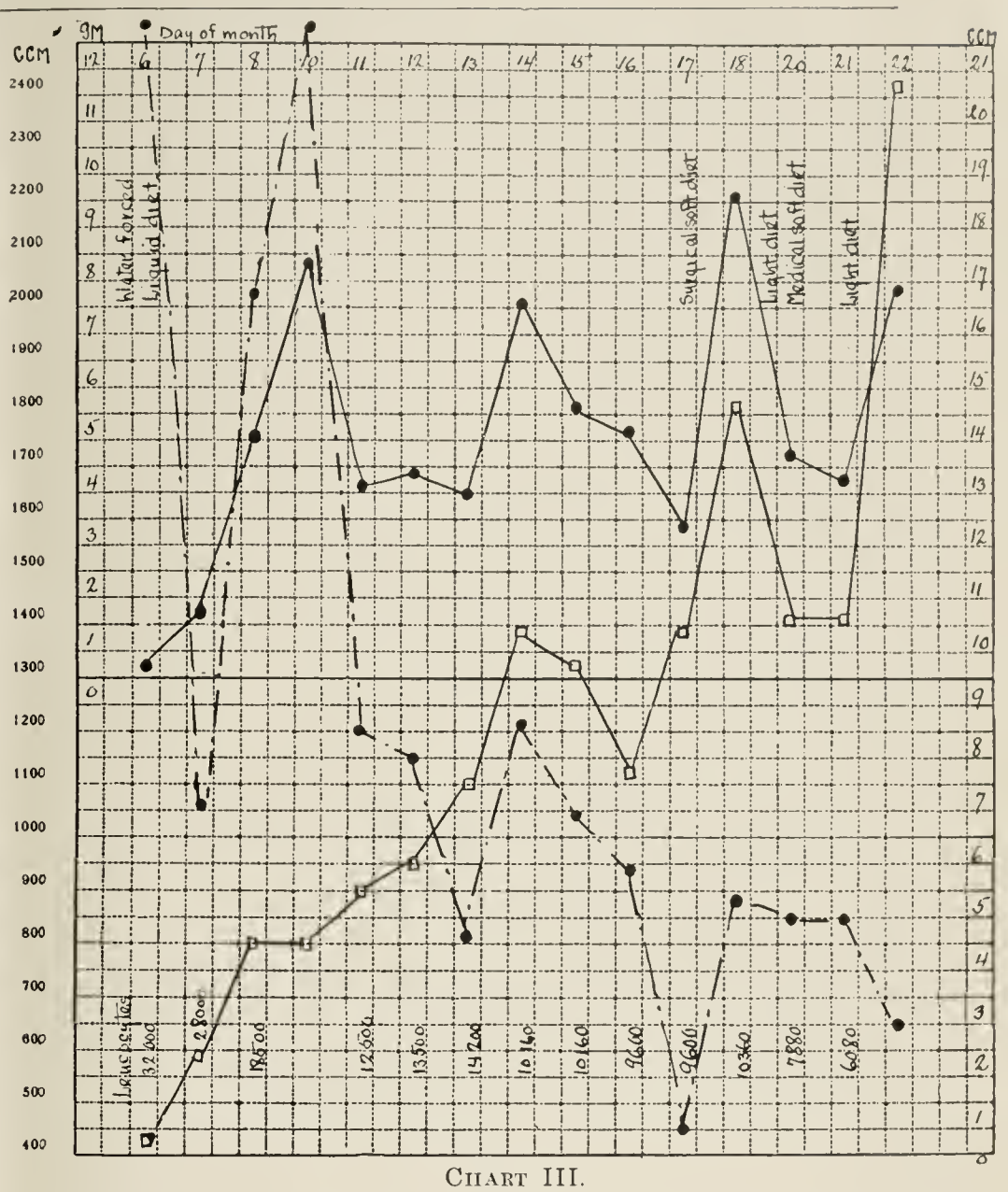

CHART III.

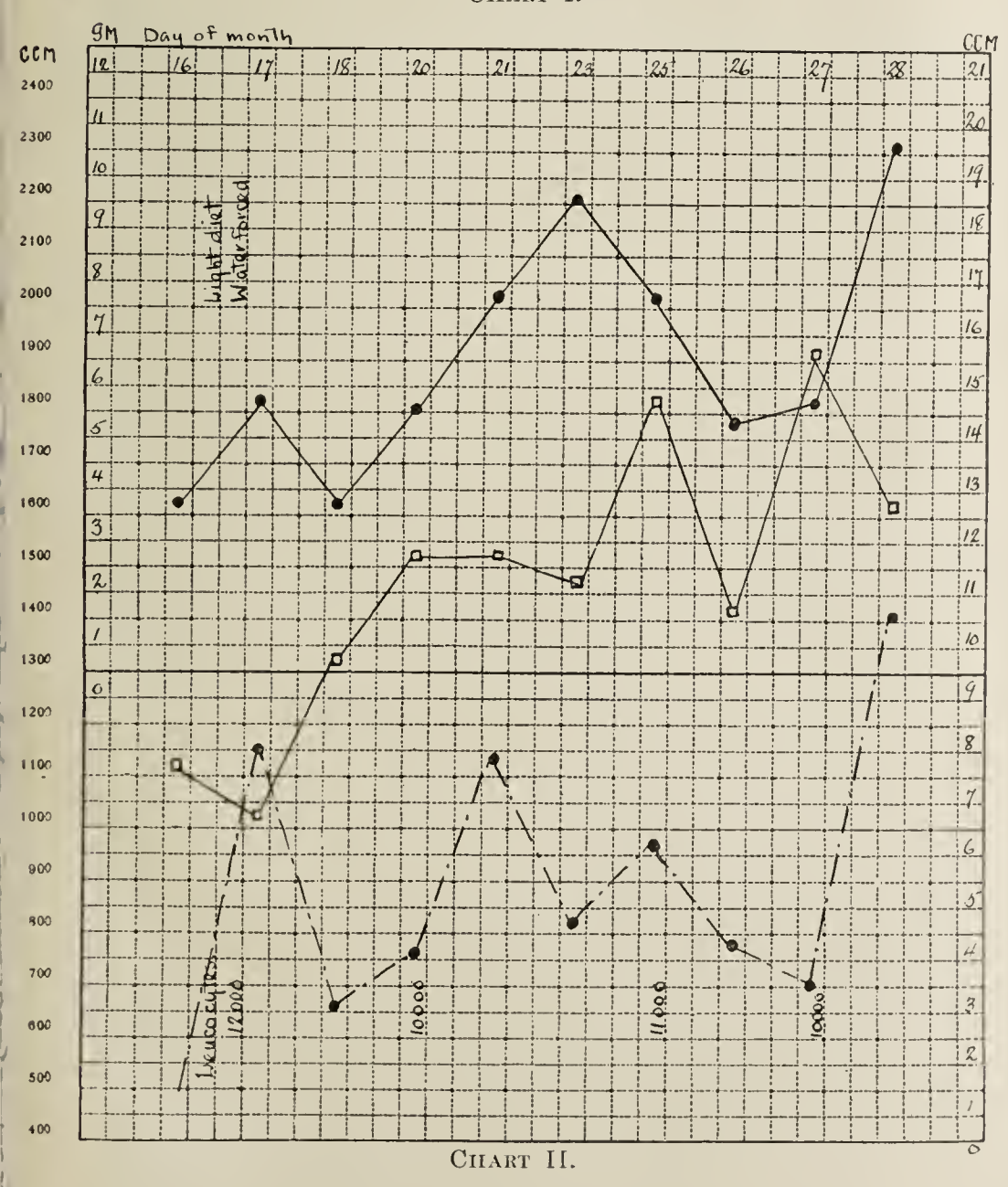

CHART II.

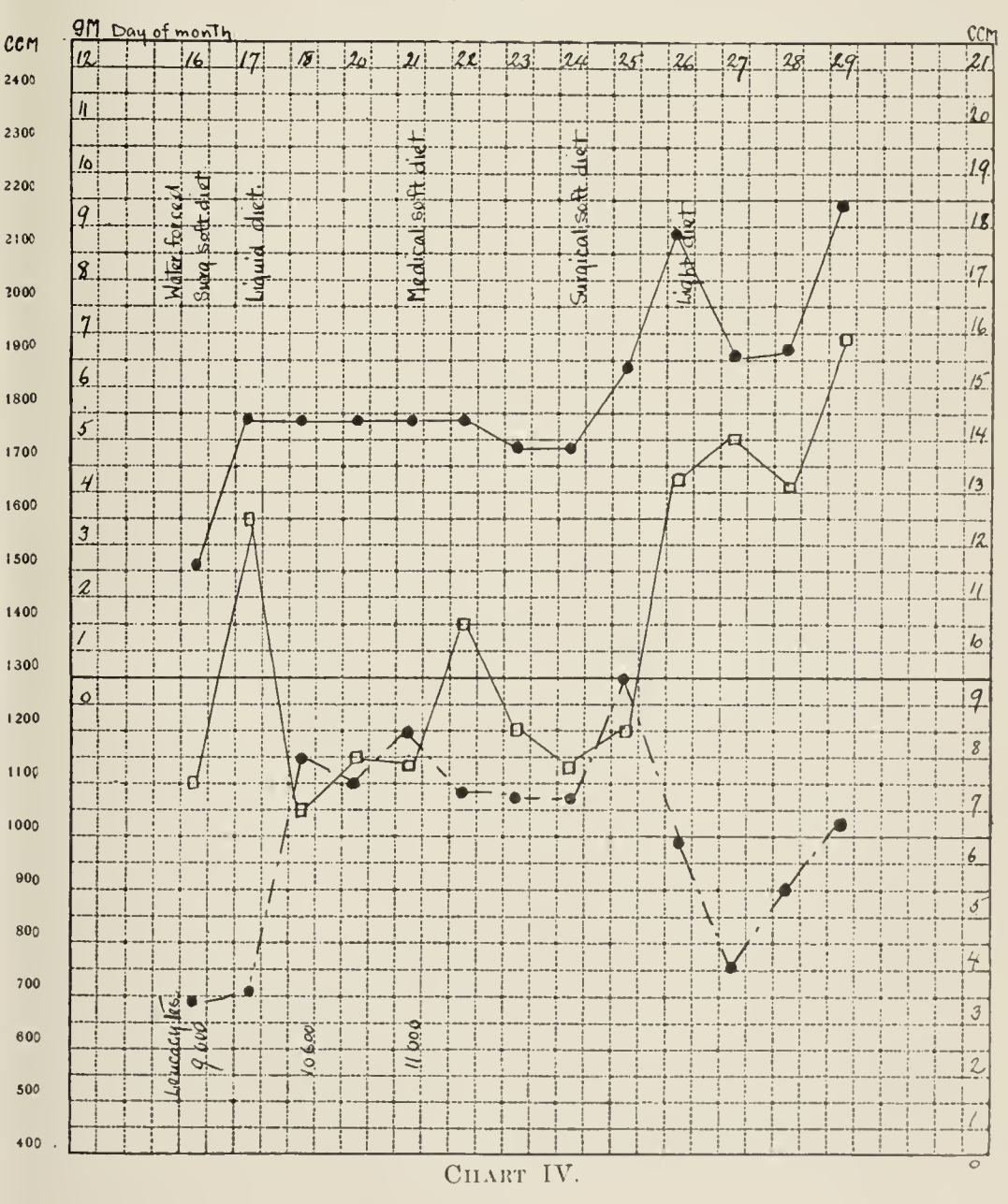

CHART IV.

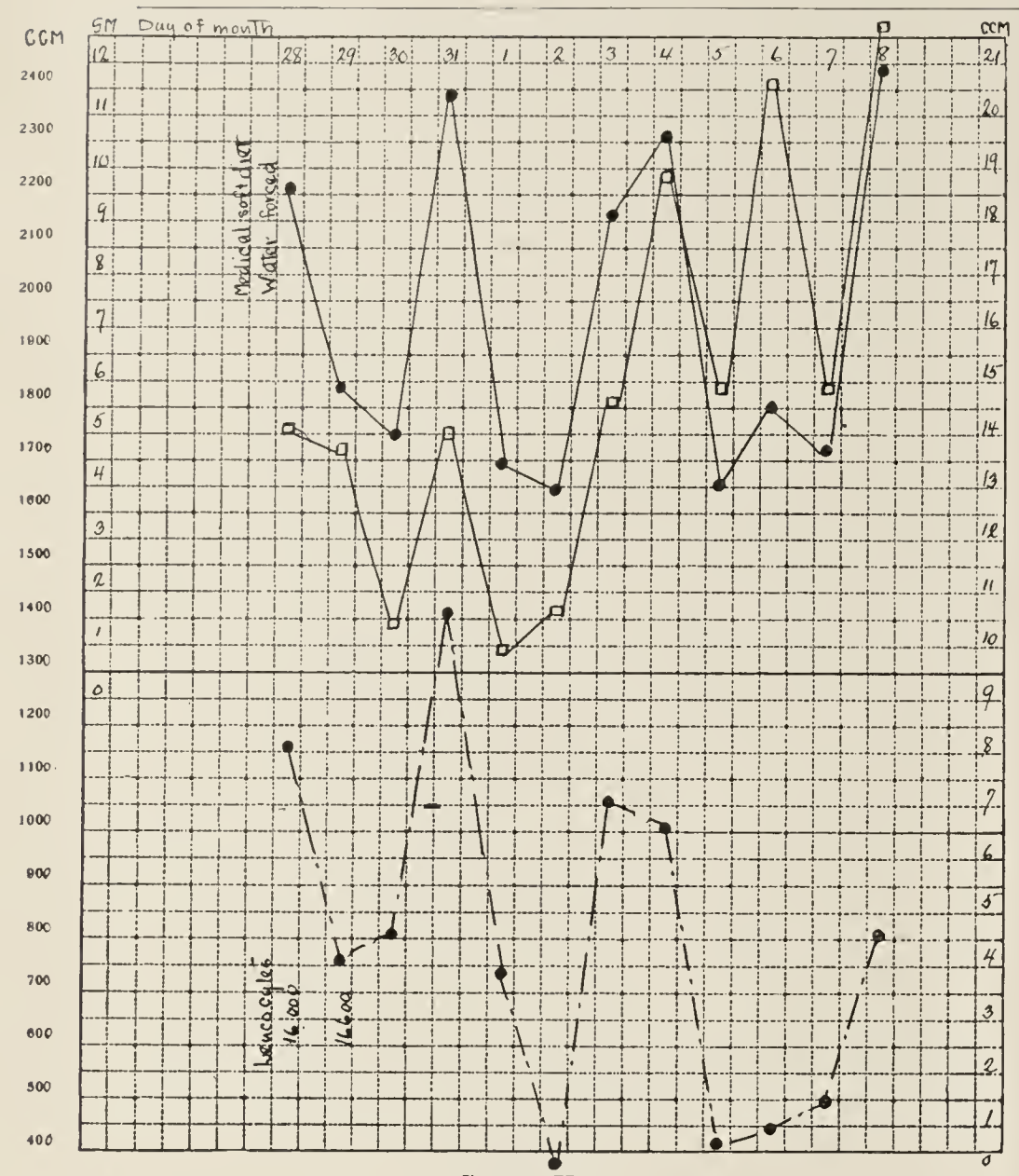

CHART V.

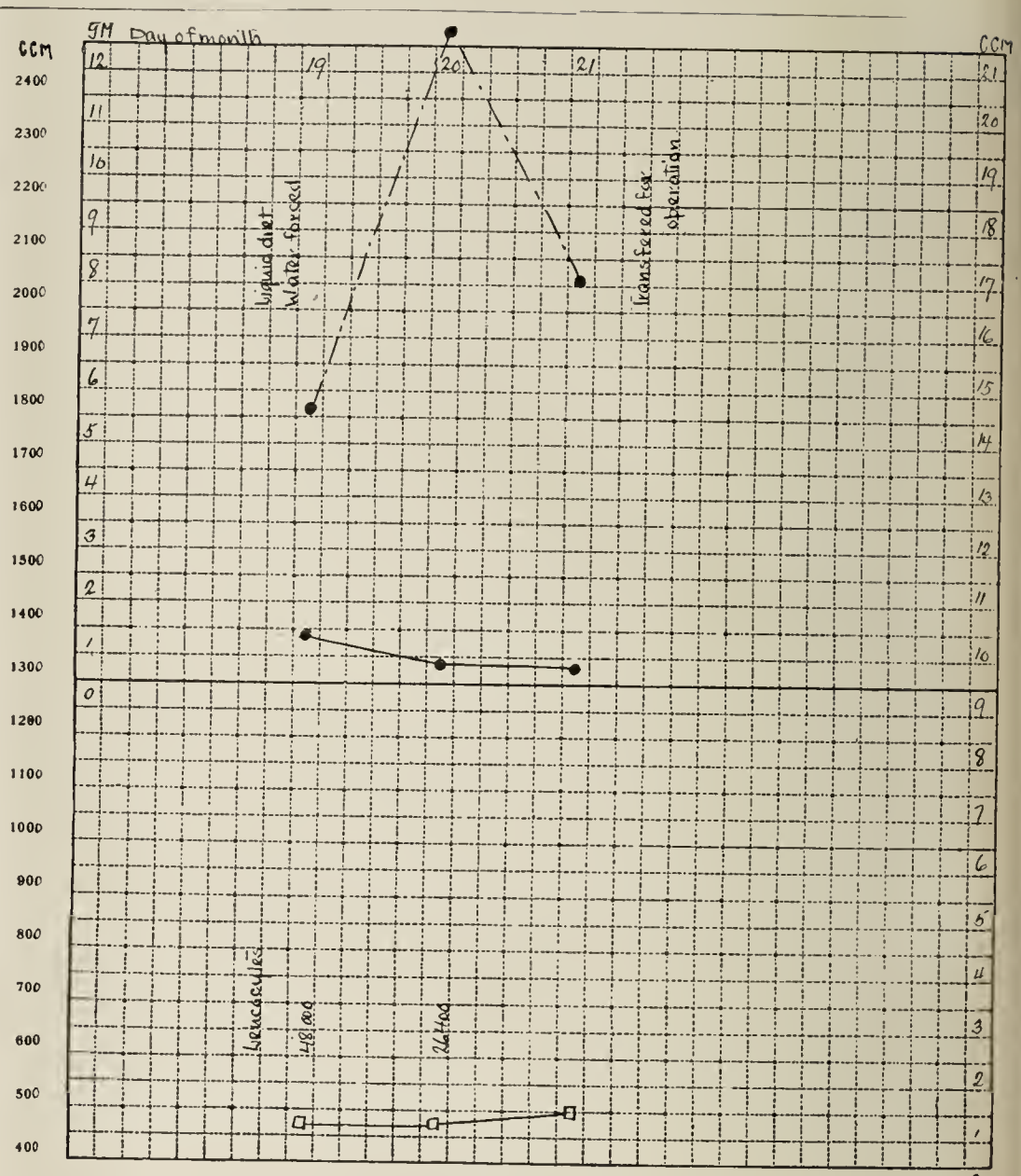

CHART VII.

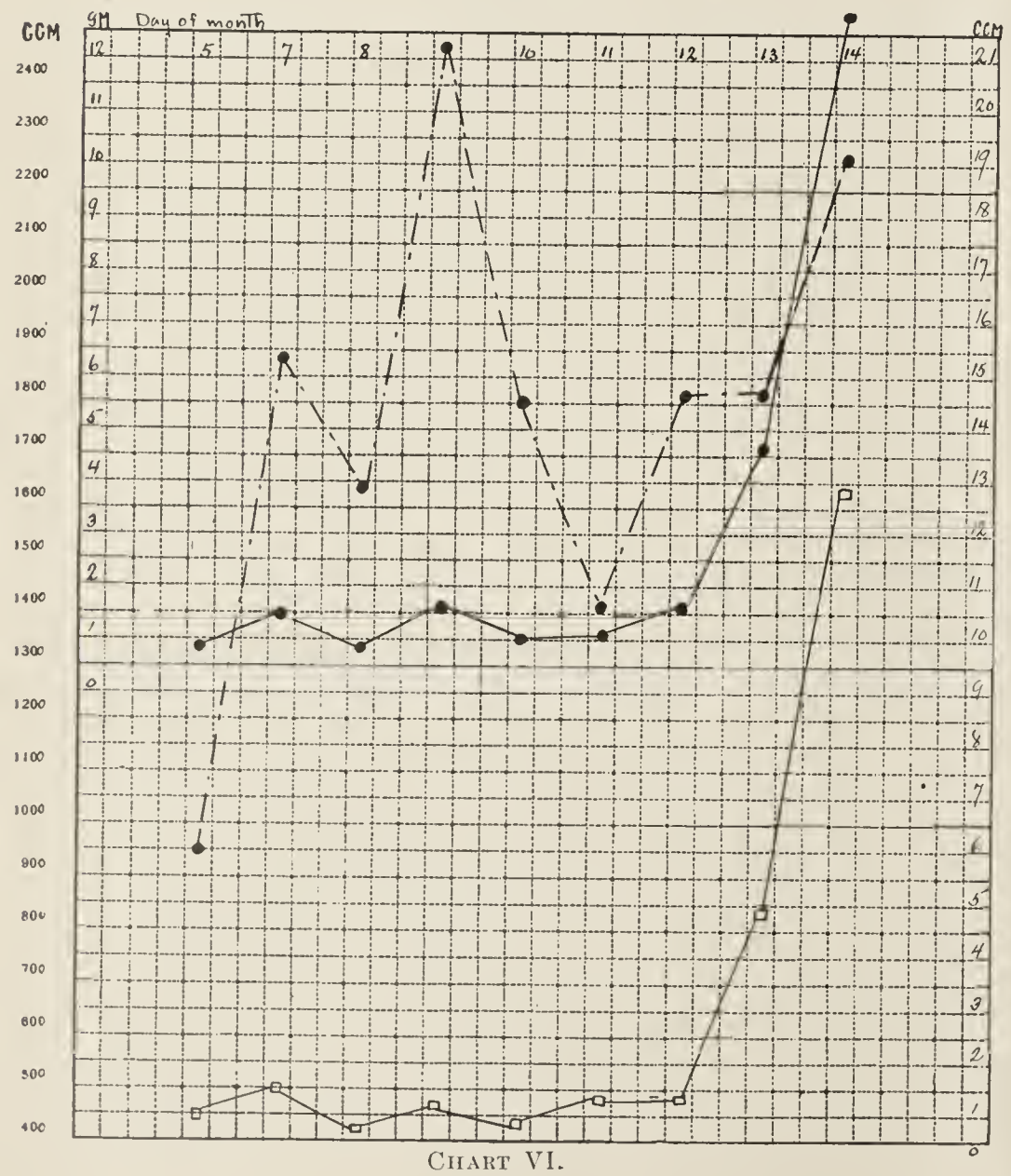

CHART VI.

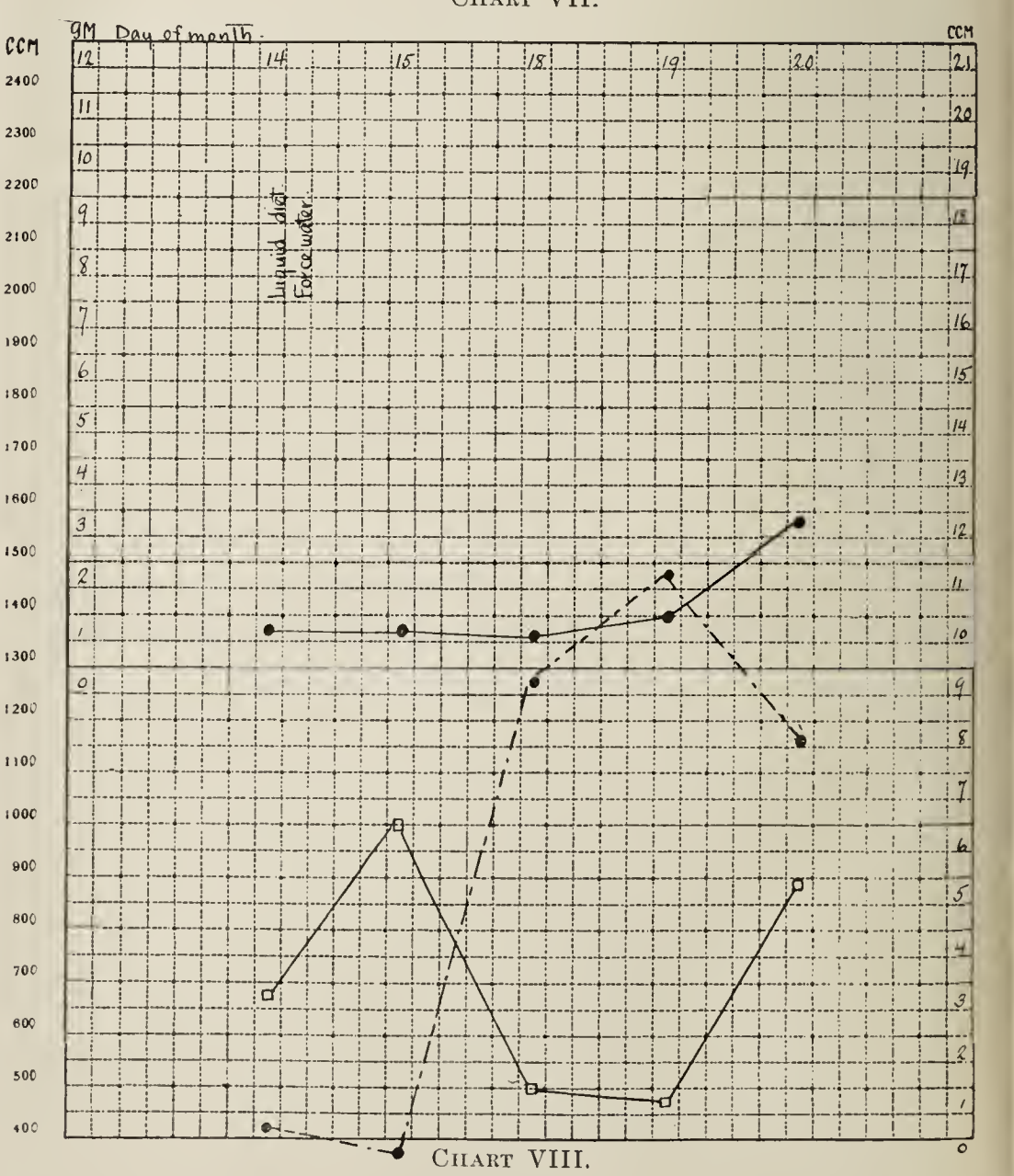

CHART VIII.

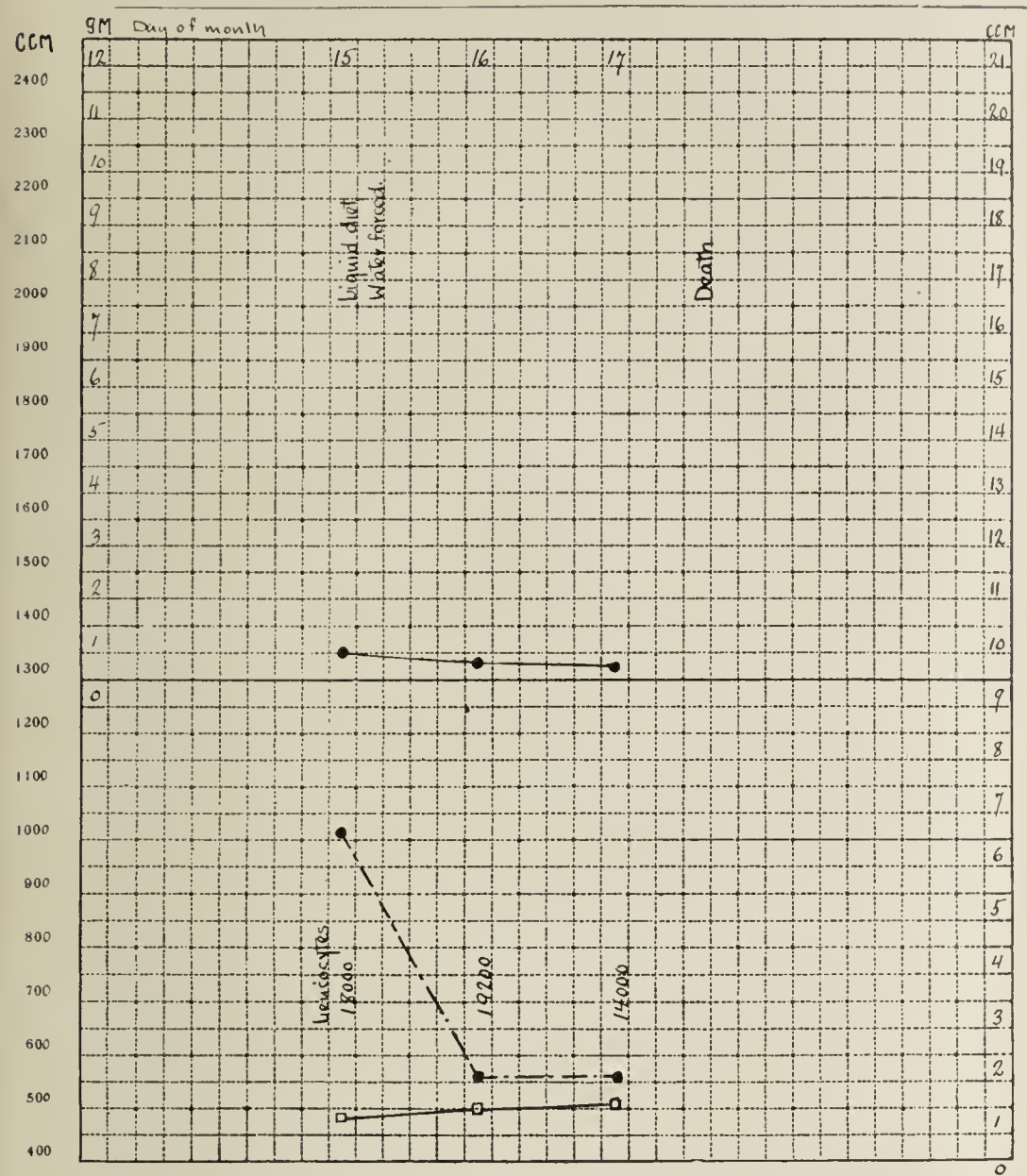

CHART IX.

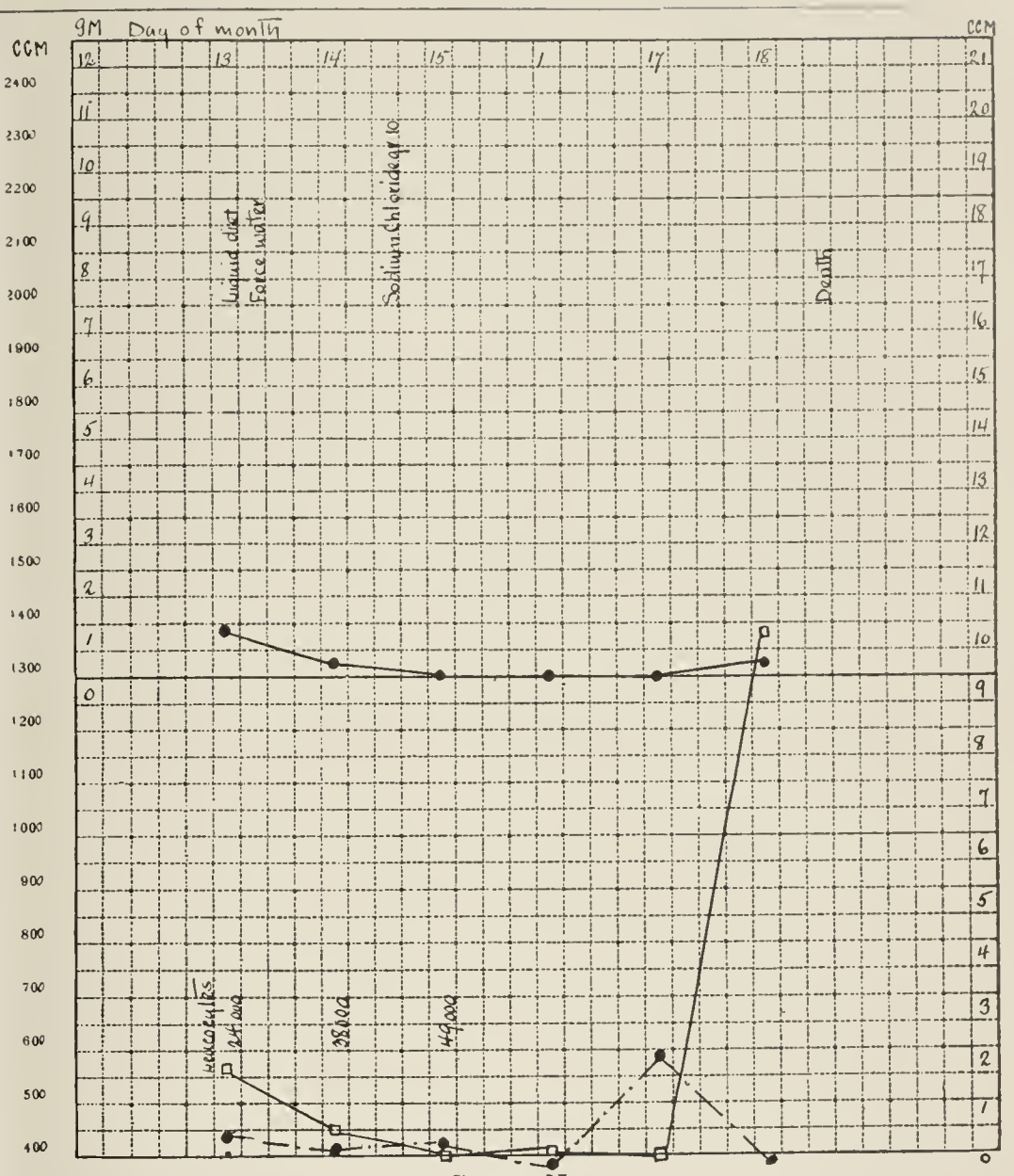

CHART X.

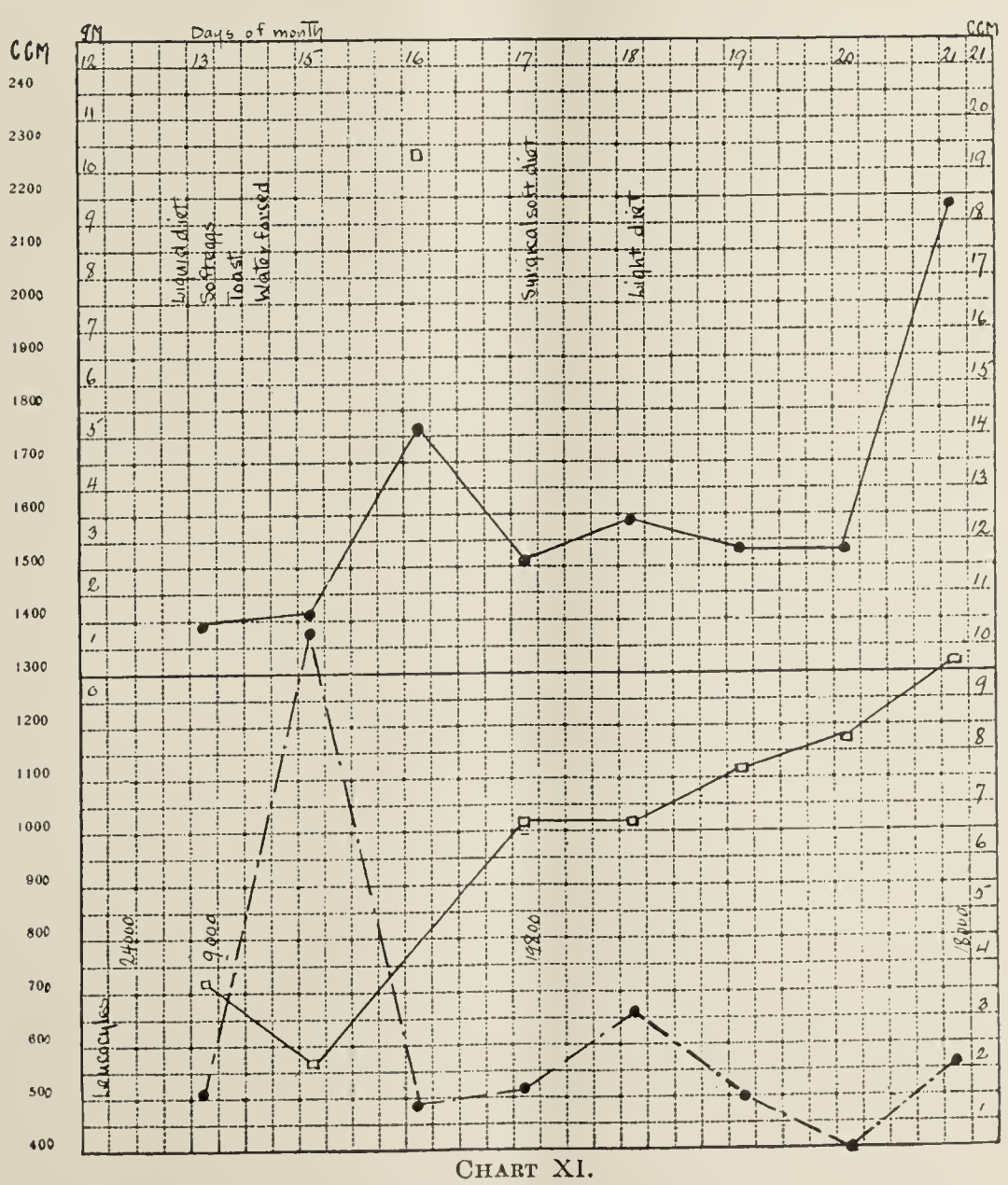

CHART XI.

$AgNO_3$ solution neeessary to preeipitate the chlorine in 10 ccm. of urine was low. In only four instances did it exeeed 7 cem.; and of these four, three readings were in the same case. One case registered zero on three successive days. The most peculiar ehart is that of W. (Chart XI). The sudden rise to 19 ccm. was associated with no eondition which would explain the rise. It quickly dropped and then showed a steady rise until 9 ccm. was reached.

Influenza pneumonia, on the other hand, did not display a low amount of ehlorine to 10 eem. of urine. Four cases started at 7 eem. or above it, while the fifth started near zero. The elimination, if estimated as the amount of chlorine in 10 eem. of urine, is very similar in all. One feature is eommon to all these cases as each patient exhibited a more or less steady rise until the normal point or one above it was reaehed. In eaeh ease the reading went above normal at the elose of the observations. So, early in influenza pneumonia we see a fair amount of chlorine in 10 ecm. of urine, with a gradual increase to normal.

Daily Output of Urine.—In lobar pneumonia the output was low except in one case in whieh it varied from 1800 to 3000 cem. The average daily output was less than a liter. The only constant feature observed was that in eaeh instanee when the daily output of urine was large the amount of chlorine in 10 cem. of urine was very small.

In influenza pneumonia the quantity of urine was very variable. Two started with small quantities, two fair quantities, and one a large quantity. All the eases passed a normal quantity during some part of the course. All exhibited a tendeney to decrease in quantity as the patient improved, and associated eonstantly with this was an increase in the amount of ehlorine in 10 eem. of urine. A rise in the quantity of urine was not necessarily assoeiated with a deereased amount of ehlorine in 10 ecm. of urine, as was observed in lobar pneumonia. The average daily output was fair throughout but was somewhat low towards the end.

Leucocytes.—All the eases of both types exhibited leucoeytosis with no marked eontrast. But as a rule the leucoeytosis was higher and more constant in lobar pneumonia. In influenza pneumonia the gradual decrease of leueoeytes was assoeiated with a diminution in the quantity of urine and increase in the amount of chlorine excreted in 10 ecm. of urine.

Temperature.—We wish to state that these eases of influenza pneumonia were not admitted at the onset of the disease. There was no definite onset in these cases as in lobar pneumonia, but merely a general feeling of ill-health for a time varying from a few days to three weeks. Three of our lobar pneumonia eases were observed late in the disease. In all of our cases the patients were very sick when observations were started and the diagnosis of the eause was not apparent, so that we feel that we are justified in contrasting the ehloride excretion in the two series.

The temperature declined gradually by lysis in all the influenza pneumonia eases and was assoeiated with gradual fall of leucocytes, diminution in the quantity of urine, and increase in the amount of ehlorine exereted in 10 eem. of urine.

Blood pressure was low in the eases observed, three cases of both series going below 90 mm. systolie pressure.

Conclusions.

1. That the retention of chlorine did not exist in the eases of influenza pneumonia studied to nearly so marked a degree as is usually found in aeute lobar pneumonia.

2. That in uncomplicated eases of influenza pneumonia there may be a normal daily exeretion of ehlorine; that if it is redueed, the reduction is not very great and does not remain low, but steadily increases by lysis till normal is reaehed.

3. That there is a tendeney for the amount of ehlorine in 10 eem. of urine and the total daily output of ehlorine to run more or less parallel in their fluctuations.

4. That the quantity of urine during the course of influenza pneumonia is not greatly diminished, and that the amount of ehlorine in 10 ecm. of urine is not markedly low; that the urine has a slight tendeney to decrease in quantity during convaleseence, while the amount of ehlorine in 10 eem. of urine steadily inereases to normal.

5. That in influenza pneumonia a large quantity of urine is not usually associated with a markedly low amount of chlorine in 10 ecm. of urine, as is usually the ease in ordinary lobar pneumonia.

In eoneluding I wish to thank Dr. C. P. Emerson and Dr. T. R. Boggs for their suggestions and help in carrying on this work.

NOTES EXPLANATORY OF CHARTS.

I. C., male, white, æt. 32. Influenza pneumonia. Five weeks before admission patient had a chill followed by fever. He went back to work, but could not keep it up. Had to stop 2 weeks on account of cough, which grew worse. Pain developed later. Entered hospital January 20. Temperature on 24, 103°; on 27, 101°. Left lower lobe involved. *B. influenzæ* in culture from sputum on 26. Diarrhœa began February 3 (4-12 stools a day). Blood pressure, systolic, 118 to 98 mm.

II. V., male, white, æt. 30. Influenza pneumonia. Rather gradual onset following debauch about Christmas. Temperature 100.5° on 16 and 17; reached normal on 20. Right lower lobe involved. January 24, *B. influenzæ* found in culture from sputum. Blood pressure 102 mm.

III. J. W., negro, æt. 23. Influenza pneumonia. Onset on December 28, with pain in the side; cough for a week previous to this. Right lower and middle lobes involved. Blood pressure on January 5, 105 mm.; on 8, 100 mm.; on 14, 78 mm. Patient recovered and was transferred to surgical side for an operation on his femur.

IV. C., male, white, æt. 65. Influenza pneumonia. Patient had been sick for nearly two weeks. Temperature 102.6° on January 16; normal on 26. Right upper and lower lobes involved. Blood pressure 85 mm. on admission; 110 mm. on 26.

V. T., male, white, æt. 32. Influenza pneumonia and pulmonary tuberculosis. Onset was gradual. Temperature from 104° to 101.5°; reached normal in the mornings after January 28. *B. influenzæ* found in culture from sputum. Left upper lobe involved—case more like one of lobar than broncho-pneumonia (Dr. Emerson). Blood pressure 88 mm. *B. tuberculosis* found in sputum February 6.

VI. C. M., male, white, æt. 24. Acute lobar pneumonia. Chart shows chlorine crisis. Right upper, middle and lower lobes involved; and left lower (?). Temperature was normal for first time on January 12.

VII. R., negro, æt. 28. Lobar pneumonia and empyema. Onset with chill February 10; pain in side February 14. Temperature 104.4°. Left lower lobe involved. Blood pressure 80 to 88 mm.

VIII. C., male, white, æt. 19. Acute lobar pneumonia. Onset February 5 with pain in side, cough, fever, and rusty sputum. Right and left lower lobes involved. Temperature 99.5° on February 14; normal on February 18. Blood pressure 118 to 100 mm. Discharged well on February 26.

IX. F., negro, æt. 24. Lobar pneumonia. Onset sudden. Temperature 104° on January 15; 100.5° on 17. Both lower lobes involved. Blood pressure 88 to 75 mm.

X. R., negro, æt. 19. Acute lobar pneumonia. Onset sudden March 18 with chill, pain in side and fever. Right upper, middle, and lower and left-lower lobes involved. Temperature 102° until death. Blood pressure 75 to 100 mm.

XI. W., male, white, æt. 18. Acute lobar pneumonia. Onset February 6 with chill, pain in the side, and fever. Right middle and lower lobes involved. Temperature above 100° on February 13; normal on February 17. Blood pressure 100 mm. Discharged well on February 29.

ERRATA.

JOHNS HOPKINS HOSPITAL BULLETIN, NOVEMBER, 1908.

Page 337, column I, line 3, for " which," read " but."

Page 338, column II, line 5, for " sufficing," read " sufficed."

NOTES ON NEW BOOKS.

Cholécysto-Pancréatite: Essai de Pathogénie. Par LE DOCTEUR REINE MAUGERET. (*Paris: G. Steinheil, 1908.*)

This monograph is one of rather more than usual importance, for it presents a new—or at least an unorthodox—theory of the pathogenesis of pancreatitis, and not only pleads for it on the basis of experimental work, but also fortifies the position taken, by a closely-reasoned consideration of the clinical phenomena of the disease.

The author's thesis (it was first really advanced by his teacher, M. Thiroloix, in a clinical lecture at the Saint Antoine Hospital in 1907), and the conclusions reached may first be set down; the reasoning which led up to them will then be reviewed in some detail.

The excellent introductory historical chapter of Maugeret's monograph shows that, though various channels of infection in pancreatitis had been suggested by Klippel as early as 1897 (ascending infection from the intestine through the bile ducts, ascending infection *via* the blood stream, infection by contiguity, and infection *via* the lymphatics) the practically unanimous opinion, at least, of surgeons, had been that pancreatitis was the result of an infection starting from the duodenum and reaching the organ by the duct of Wirsung. Tuberculous pancreatitis was regarded as an exception, after its lymphatic transmission had been established by Klippel; the ordinary infections were always assumed to pass up the ducts; an obstruction of the duct of Wirsung (as Mayo Robson held) being the principal determining cause of the condition and gall-stones being the usual form of obstruction. Desjardins (1905) regarded pancreatitis and cholelithiasis as contemporaneous phenomena—both due to intestinal infection which, in the gall-passages, produces stones, in the pancreas, inflammation.

The theory of M. Thiroloix, on the other hand, is as follows: Every cholelithiasis begins as a mild cholecystitis, which may and often does lead to a deposit of cholesterin and the formation of calculi. This infection of the gall-bladder tends to chronicity, and becomes a constant source of danger to neighboring organs. It leads to localized peritonitis over duodenum, pylorus, colon, and gall-bladder; it leads to localized hepatitis; but, most important of all it travels up the lymphatics and leads to the sclerotic changes in the pancreas so long recognized as a frequent concomitant of gall-stones. " In the genesis of biliary pancreatitis the infection and not the calculus is the important factor." To test the validity of this assumption Maugeret undertook his clinical and experimental research which led him to the following conclusions: 1. Pancreatitis co-existing with cholelithiasis is neither an independent nor a contemporaneous and parallel affection due to the same initial cause. It is a true complication. 2. Its starting point is neither directly nor indirectly an intestinal infection. 3. The infection does not reach the pancreas by the duct. 4. The infection does not reach the pancreas by contiguity. 5. In all cases of cholelithiasis, no matter what their nature (*i. e.*, no matter what the infecting agent?) the cause of the pancreatitis is the same. 6. This sole cause of pancreatitis in cholelithiasis is the infection of the gall-bladder. 7. The gall-bladder infection reaches the pancreas by the efferent vessels of the gall-bladder which empty into a group of glands near the head of the pancreas, the same group receiving lymphatics from the gland itself. 8. Infection of the pancreas *via* the lymphatics is not only possible, but frequent.

The argument. 1. Anatomical basis. Briefly, the facts are these. The lymphatics of the pancreas and those of the biliary tracts all converge toward the same spot—namely, the head of the pancreas; and here there is free anastomosis among them. The head of the pancreas is, therefore, a " carrefour lymphatique "; into it empty the lymphatics of the gall-bladder, the biliary tracts, the liver, and the pancreas itself. These facts fit in well with Thiroloix's hypothesis as to the genesis of pancreatitis; and they explain fully the elective predominance which pancreatic lesions show for the *head* of the organ. (But one hesitates to go along with Maugeret and speak confidently of a cholecysto-appendicitis, analogous to this cholecysto-pancreatitis, the infection reaching the vermiform appendix by the mesenteric lymphatics. At least, such a clinical entity is, as yet, a conception, as Maugeret would say " assez vague." The suggestion is, however, interesting; no doubt, lymphatic transmission of infection through the abdomen has not received sufficient attention.)

2. Pathological considerations. " Enlarged glands in the small omentum," says Mayo Robson, " may be found in pancreatitis as well as in cancer." Kehr, on the other hand, makes their absence in pancreatitis a point in the differential diagnosis from carcinoma. They are certainly present in tuberculous pancreatitis, and on their presence Klippel based his theory of the lymphatic transmission of this disease. Enlarged glands have been frequently reported; but they are not constantly seen, being overlooked, says Maugeret, on account of their softness. (The argument here is weak; if the glands are so frequently overlooked, how do we know that they are usually present? And might not their presence, in any case, be a *result* and not a mediate *cause* of the pancreatitis?)

Pancreatitis is most often associated with stone in the common duct. This does not mean that the common duct stone has caused the pancreatitis, but that the pancreatitis (originating in the gall-bladder infection) has caused the calculus to lodge in the common duct, which—partially blocked by œdema and swelling

of the pancreas—refuses to allow the gall-bladder stone to pass through its intra-glandular portion. One, therefore, often sees pancreatitis without stone in the common duct; but never stone in the common duct without pancreatitis" (! and also ?).

3. The possibility of ascending infection through the duct. This, though always assumed, has never been demonstrated. Only two proven instances of ascending infection are known; the first was in the experiment of Carnot, who brought it about by placing a thread in the duct of Wirsung and thus produced wholly artificial conditions; and the second instance is in the rare cases of pancreatitis associated with lumbricoid worms in the duct, an entirely exceptional condition. The well-known observation of Opie and Halsted is also regarded by Maugeret as representing quite an unusual state of affairs. Even if biliary reflux *did* take place frequently, pancreatitis would not be thereby explained; for Claude Bernard observed cases of such a spontaneous reflux in man (as evidenced by staining of the mucosa) without lesions in the pancreas. ("But," one must ask, "was the bile infected in these cases?")

Furthermore, the pancreatic juice is bactericidal; its current is constantly efferent; and the normal ærobic and anærobic flora, which Gilbert and Lippmann have shown to exist within the distal 2 or 3 cm. of the duct of Wirsung, are either swept away or killed. These facts speak against the possibility of ascending infection. (This chapter raises many questions. On the whole, the logic is sound; it is easy to attack it at many points, but space forbids it here. One regrets that the problem of ascending infection of the kidney from the bladder does not seem to have occurred to the author as analogous with his own. This problem has been argued about for years; a consideration of the points brought forward in the debate would have been very useful in providing analogies; the conclusions reached would have supported Maugeret's contention, for there is little doubt that infection, though by no means rarely reaching the kidney *via* the ureter very often takes another path.)

4. Therapeutic considerations. The treatment of pancreatitis is essentially surgical and consists in drainage, *i. e.* disinfection of the gall-bladder. Simple removal of the obstacle (the common-duct stone) is not enough; it is the disinfection which does the work, and which "is always efficacious." This is the strongest argument against the intestinal origin of pancreatitis and in favor of the idea that the infection originates in the gall-bladder. Cholecystectomy, rather than simple cholecystostomy, is suggested as the more radical procedure in the treatment of pancreatitis; and the opinion of Lejars and Quénu is quoted with approval that "in gall-stones of the gall-bladder, simple cholecystectomy without drainage may be, and indeed in many cases has been shown to be, sufficient."

(Maugeret quotes three clinical cases to support his contention. In two, simple choledochotomy with removal of the stone was done, and in both of these the pancreatitis persisted; in the third cholecystectomy, with drainage of the hepatic duct, was performed and in this patient the pancreatitis was cured. One must remark, however, that simple choledochotomy without drainage of the gall-bladder is insufficient treatment for pancreatitis *no matter how the infection reaches the pancreas*. Furthermore, one cannot accept off-hand the statement that the "pancreatitis persisted," in view of the great difficulty experienced in making a diagnosis of this condition, even after study of the fat-content of the stools; though it would not be at all surprising if it *did* persist after such inadequate treatment. In any event the number of cases reported is too small to warrant conclusions. One hesitates, too, to accept Maugeret's suggestion that cholecystectomy be substituted for cholecystostomy on the principle, apparently, that if drainage is good ablation must be better. Lejars and Quénu are quoted as saying that "in simple gall-stones of the gall-bladder, cholecystectomy without drainage may be sufficient"; which runs somewhat counter to orthodox surgical teachings; though they save themselves, to an extent, by conceding that drainage, which is often a useful complement, "is particularly indicated in infected lithiasis.")

5. Experimental basis. Dogs were the animals used and nine experiments were done. The gall-bladder was injected with .5 to 3 cm. formol and the dogs killed from 2 to 46 days after the injection. Attempt was made to determine the path of absorption by introducing into the gall-bladder, along with the formol, a small amount of powdered charcoal; but the attempt failed. The charcoal was never found except in the gall-bladder or ducts. The formol produced, of course, a chemical cholecystitis; but the important fact was that when the dogs were killed they were found to have either an acute or a chronic pancreatitis. The acute condition was represented in one case by a hemorrhagic pancreatitis; in another by pancreatico-peritoneal hemorrhage with cysto-steato-necrosis. The authors also observed accentuation of the normal lobulation (amounting sometimes to actual "morcellement"); great increase in the number and size of the islands of Langerhans, with the existence of transition forms between them and the acini; intense congestion; in every case edema and leucocytic infiltration. The chronic inflammation took the form of an inter-lobar and inter-acinous sclerosis. The experiments proved, therefore, that pancreatitis could be brought about by producing cholecystitis and also afforded an opportunity to study the histogenesis of the disease—an opportunity of which the author has made good use.

(There is no doubt about the importance and interest attaching to this experimental contribution. The study of such a complex problem raises many questions, which one must leave unanswered if the research is not to be allowed to stray from its original purpose. One regrets, however, that the study of the path of absorption was abandoned without ado because, forsooth, the "charcoal particles were perhaps too large to be absorbed." This was, indeed, the essential question and the answer should have been found at all costs. It is to be regretted, also, that infectious cholecystitis was not produced; this would have reproduced clinical conditions more exactly than a chemical cholecystitis; some easily recognizable organism could have been used and its passage through the lymphatics demonstrated. The absorptive function of the gall-bladder might have been studied; its known capacity for retaining organisms for long periods of time (as after typhoid fever) would seem to indicate its poor absorptive power, and this *may* have been why charcoal was never found in the lymphatics. If the gall-bladder is at all analogous to the urinary bladder one would expect it to do very little absorbing. Another noticeable lack is the absence of good notes about the histological changes in the common duct; there is little more in the protocols than a report of macroscopic findings or the entirely trivial announcement that the "cholédoque contient une boue charbonneuse.")

J. C.

Cancer of the Womb: Its Symptoms, Diagnosis, Prognosis, and Treatment. By Frederick John McCann, M. D., F. R. C. S., M. R. C. P. 172 pages. 20*s.* net. (*London: Oxford University Press, 1907.*)

In a monograph of 172 pages the author presents the results of his wide personal experience and observation concerning carcinoma of the uterus. After a concise description of the normal anatomy and physiology of the uterus, the etiology of cancer in general, and especially of uterine cancer, is briefly considered. In the following chapters the pathology, clinical history, diagnosis, prognosis, and treatment of the various forms of uterine carcinoma are discussed. Detailed descriptions of cases representing the different varieties of cancer are given and are illustrated by reproduction of photographs and photomicrographs. I cannot

agree with the author that photographs give a truer representation of the appearance of the specimen than reproduction of good drawings. For the most part the photographs are hazy, and the distinction between normal and pathological tissues is ill-defined. The failure of photography to do more than give mere outlines in the case of anatomical specimens, is probably often due to the presence of blood and moisture on the surface; whereas in making a drawing of the tissue the artist is not influenced by adventitious conditions.

The author rightly condemns the publication in the lay press of descriptions of the disease, and believes that more good can be accomplished by the better education of the general practitioner and the instruction of mid-wives and district nurses, so as to enable them to warn their patients to seek a consultation on the earliest appearance of any abnormality. The early diagnosis by means of the microscope is strongly urged. The author's advocacy of supravaginal amputation of the cervix in some cases of early carcinoma cannot be too strongly condemned. The only hope of increasing the appallingly low percentage of permanent cures in carcinoma of the cervix rests in the radical extirpation of the uterus and parametrium in early stages of the disease. As Dr. McCann states that the recurrences in these cases were almost without exception not at the site of operation, but in the parametrium, the better prognosis of a radical operation is evident.

Sarcoma of the uterus is briefly considered, and this is followed by a chapter on deciduoma malignum. The short chapter on post-operative treatment is excellent, and if the advice contained in it were more generally followed, many patients would be benefited.

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INDEX TO VOLUME XIX OF THE JOHNS HOPKINS HOSPITAL BULLETIN.

Abscess of bone caused by an "intermediate" bacillus (B) allied to *B. paratyphosus*, 44.
Adami, J. G., Sir John Harington, 285.
Anæsthesia, Pulmonary complications following, 89.
Anatomy, The barred road to, 196.
Announcement of scholarships and fellowships, Rockefeller Institute for Medical Research, 113.
Aortic insufficiency, The axillary diastolic murmur in, 353.
Auricular fibrillation, paroxysmal tachycardia, and the so-called auriculo- (atrio-) ventricular extrasystoles, Contributions to the study of, 322.
Avicenna and Arabian medicine, 157.
Bandage for the leg, A satisfactory pressure, 114.
Berkley, H. J., Therapeutic note on the action of lecithin in exophthalmic goiter, 259.
Bile, The hæmolytic action of, and its inhibition by blood-serum, 268.
Bloede, V. G., A comprehensive plan for the treatment of the tuberculosis problem, 349.
Blood, A clinical study of the alkalinity of the, 137.
Blood, Three cases illustrating the relationship between certain diseases of, and sarcoma, 332.
Blood, Variations in the calcium content of, following therapeutic measures, 201.
Blood corpuscles, The effect of heated serum on rouleaux formation of red, 271.
Blood pressures, The obstetrical significance of, and their relation to the work of the heart, 194.
Blood-serum, The hæmolytic action of bile and its inhibition by, 268.
Blood-serum, normal, The pro-infective ("aggressive") action of, 249.
Blood-vessels, Abnormalities of the pulmonary, 221.
Boggs, T. R., Variations in the calcium content of the blood following therapeutic measures, 201.
Books received, 26, 62, 100, 126, 155, 185, 247, 375.
Bordley, J., Jr., A family of hemeralopes, 278.
Bronchial stenosis, The relation of, to bronchiectasis, 230.
Bushnell, F. G., Abscess of bone caused by an "intermediate" bacillus (B) allied to *B. paratyphosus*, 44; Three cases illustrating the relationship between certain diseases of the blood and sarcoma, 332.
Calcium content of the blood, Variations in the, following therapeutic measures, 201.
Calvert, W. J., Cardiohepatic angle, 143; Sudden death in pleurisy with effusion due to a change of position, 44.
Cardiac disease, Certain clinical features of, 361.
Cardiohepatic angle, 143.
Carroll, Major James, M. D., U. S. A., 1.
Cecil, A. B., and Cole, R. I., The axillary diastolic murmur in aortic insufficiency, 353.
Chatard, J. A., Avicenna and Arabian medicine, 157.
Chlorine, The contrast in the excretion of, in influenzal pneumonia and in ordinary lobar pneumonia, 367.
Cole, R. I. and Cecil, A. B., The axillary diastolic murmur in aortic insufficiency, 353.
Cole, R. I. and Smirnow, M. R., The pro-infective ("aggressive") action of normal blood-serum, 249.
Crowe, S. J., On the excretion of hexamethylenamin (urotropin) in the bile and pancreatic juice, 109.
Davis, J. S., A satisfactory pressure bandage for the leg, 114; Primary hemangiomata of muscle, 74.
Denison, H. S., Amboceptors and complement in typhoid sera, 263.
Discussion: Dr. Barker, On the use of small doses of thyroid extract in the diagnosis of Basedow's disease, 48;—Barker, L. F., Intraventricular systole, 208; The cause of the "loco" disease, 244;—Boggs, T. R., A clinical study of the alkalinity of the blood, 117;—Cole, R. I., Enteritis with meningeal symptoms followed by multiple neuritis, 146;—Cushing, H., Splenectomy, with report of six cases, 179;—Finney, J. M. T., The practical value of the demonstration of *Spirochæta pallida* in the early diagnosis of syphilis, 94; Pancreatic disease, 96; Pathological-surgical specimens, 146;—Dr. Futcher, A study of the cases of pneumonia empyema occurring in the Johns Hop-

kins Hospital, 117;—Futcher, T. B., The cause of the "loco" disease, 243;—Hirschfelder, A. D., Intraventricular systole, 208;—Howard, W. T., The kern-plasma relation theory, 179;—Hunner, G. L., Splenectomy, with report of six cases, 178;—Hurd, H. M., Pathological-surgical specimens, 146; Medical education in the United States, 206; The cause of the "loco" disease, 244;—Dr. MacCallum, On the use of small doses of thyroid extract in the diagnosis of Basedow's disease, 48;—Randolph, R. L., A family of hemeralopes, 93; Two cases of cerebrospinal meningitis treated by Flexner's meningitis serum, 95;—Thayer, W. S., Intraventricular systole, 208; —Dr. Thomas, The subtemporal decompressive operation for the relief of pressure symptoms due to fracture of base of skull, 49;—Voegtlin, C., A clinical study of the alkalinity of the blood, 117;—Welch, W. H., A case of gas-cyst of the intestine, 177; The kern-plasma relation theory, 179; Medical education in the United States, 206.

Dochez, A. R., A preliminary report upon the effects of feeding animals upon an iodine-free diet, 235.

Donnally, H. H., Major James Carroll, M. D., U. S. A., 8.

Dorsey, John Syng, The secret of his success, 127.

Dunton, W. R., Jr., Further note on Mrs. Packard, 192.

Electrology and radiology, Fourth International Congress on, 114.

Evans, H. M., On the occurrence of newly-formed lymphatic vessels in malignant growths, 232.

Exophthalmic goiter, Therapeutic note on the action of lecithin in, 259.

Eyster, J. A. E., and Hooker, D. R., An instrument for the determination of venous pressure in man, 274.

Gastro-mesenteric ileus, Acute and chronic, with cure in a chronic case by duodeno-jejunostomy, 252.

Geraghty, J. T., The practical value of the demonstration of *Spirochæta pallida* in the early diagnosis of syphilis, 364.

Gibson, G. A., Certain clinical features of cardiac disease, 361.

Goldsborough, F. C., The maternal mortality in the first 5000 obstetrical cases at the Johns Hopkins Hospital, 12.

Goldsborough, F. C. and Slemons, J. M., The obstetrical significance of the blood pressures and their relation to the work of the heart, 194.

Gould, G. M., Ophthalmovascular choke, 101.

Von Haller, Albrecht: Scientific, literary and poetical activity, 65.

Hamman, L., The statistics of tuberculosis peritonitis from the clinical records of the Johns Hopkins Hospital, 256.

Harington, Sir John, 285.

Heart, The obstetrical significance of the blood pressures and their relation to the work of the, 194.

Hemangioma of muscle, Primary, 74.

Hemeralopes, A family of, 280.

Hemmeter, J. C., Albrecht von Haller: Scientific, literary and poetical activity, 65.

Hernia, Right meso-jejunal, 219.

Hexamethylenamin (urotropin), On the excretion of, in the pancreatic juice, 109.

Hirschfelder, A. D., Contributions to the study of auricular fibrillation, paroxysmal tachycardia, and the so-called auriculo-(atrio-) ventricular extrasystoles, 322; The volume curve of the ventricles in experimental mitral stenosis and its relation to physical signs, 319.

Hodgkins Fund Prize, Smithsonian Institution, 125.

Hooker, D. R. and Eyster, J. A. E., An instrument for the determination of venous pressure in man, 274.

Hospital staff, January 1, 1908, 31, 126.

Howard, W. T., The kern-plasma relation theory, 161.

Intestinal anastomosis without open incisions by means of basting stitches. 132.

Iodine-free diet, A preliminary report upon the effects of feeding animals upon an, 235.

Jelliffe, S. E., The psychiaters and psychiatry of the Augustan era, 308.

Kelly, H. A., Major James Carroll, M. D., U. S. A., 1; The barred road to anatomy, 196.

Kern-plasma relation theory, 161.

King, A. F. A., Major James Carroll, M. D., U. S. A., 9.

Lecithin in exophthalmic goiter, Therapeutic note on the action of, 259.

Leucocytes, The effect of injected, upon the development of a tuberculous lesion, 115.

Lymphatic vessels, On the occurrence of newly-formed, in malignant growths, 232.

MacCallum, W. G., The school of Montpellier, 296; The teaching of pathological physiology. III. Organs of respiration, 215.

MacCallum, W. G., and Miller, R. T., Right meso-jejunal hernia, 219.

MacCallum, W. G., and Voegtlin, C., On the relation of the parathyroid to calcium metabolism and the nature of tetany, 91.

Maternal mortality in the first 5000 obstetrical cases at the Johns Hopkins Hospital, 12.

Medical laboratories abroad, A visit to some of the, 188.

Medicine, Some of the conditions which have influenced the development of American, especially during the last century, 33.

Meloy, C. R., Abnormalities of the pulmonary blood-vessels, 221.

Miller, R. T., and MacCallum, W. G., Right meso-jejunal hernia, 219.

Mitchell, J. K., Diagnosis and treatment of neurasthenia, 41.

Mitral stenosis, The volume curve of the ventricles in experimental, and its relation to physical signs, 319.

Monroe, C. E., Major James Carroll, M. D., U. S. A., 10.

Montpellier, The school of, 296.

Moss, W. L., A recent visit to some of the medical laboratories abroad, 188.

Muffet, Thomas, 1553-1604, 312.

Neurasthenia, Diagnosis and treatment of, 41.

North, Dr. Elisha, One of Connecticut's most eminent medical practitioners, 301.

Notes and news, 24, 148, 282.

Notes on new books, 20, 51, 96, 118, 149, 180, 209, 245, 282, 344, 373; —Arrhenius, S., The application of the principles of physical chemistry to the study of biological antibodies, 121;—Ballenger, W. L., Diseases of the nose, throat and ear, 283;—Bardswell, N. D., Diets in tuberculosis, principles and economics, 182; The consumptive working man—What can sanitaria do for him? 20;—Barnhill, J. F., Modern otology, 153;—Barrus, Clara, Nursing the insane, 209;—Beers, C. W., A mind that found itself, 182;—Benedict, A. L., Golden rules of dietetics, 348;—Boas, I., Diseases of the stomach, 120;—British Guiana Medical Annual for 1906, 122;—Brockbank, E. M., Life insurance and general practice, 183;—Brown, L., Twenty-third annual report of the Adirondack Cottage Sanitarium, Saranac Lake, N. Y., 210;—Bryant, J. D., and Buck, A. A., American practice of surgery, 184;—Buchanan, A. M., Manual of anatomy, ii, 55;—Bulletin of Iowa institutions, 212;—Bulletin of the Ontario Hospitals for the Insane, 121;—Bulletin of the Toronto Hospital for the Insane, 154;—Bulstrode, H. T., Thirty-fifth annual report of the local government board, 1905-1906. "On sanitaria for consumptives and certain other aspects of the tuberculosis question," 181;—Burdett, H., Burdett's Hospitals and Charities, 1908, 184;—Cabot, A. T., Papers upon genito-urinary surgery, 55;—Christophers, S. R., Piroplasma canis and its life cycle in the tick, 212;—Church, A., editor, Modern clinical medicine. Diseases of the nervous system, 153;—Confessio Medici, 120;—Corner, E. M., Diseases of the male generative organs, 54;—Corner, E. M, and Pinches, H. I., Operations of general practice, 119;—Crossen, H. S., The diagnosis and treatment of diseases of women, 120;—DaCosta, J. C., Modern surgery: General and

operative, 53;—Danforth, I. N., The life of Nathan Smith Davis, 23;—Daniels, C. W., Studies from Institute for Medical Research, Federated Malay States. Vol. iii, part 3. Breeding grounds of culicidæ, 284;—Dawbarn, R. H. M., An aid to materia medica, 184;—Department of neurology. Harvard Medical School, 212;—Drew, G. A., A laboratory manual of invertebrate zoology, 284;—Dwight, T., A clinical atlas, 52;—Dwight, T., Hamann, C. A., McMurrich, J. P., Piersol, G. A., and White, J. W., Human anatomy. Including structure and development and practical considerations, 125;—Eisendrath, D. N., Surgical diagnosis, 118;—Etiology and epidemiology of plague, 210;—First and second interim reports of the Royal Commission appointed to inquire into the relations of human and animal tuberculosis, 181;—Fischer, L., Diseases of infancy and childhood, 151;—Foote, E. M., A text-book of minor surgery, 246;—French, H. C., Syphilis in the army, 23;—Fuchs, E., Text-book of ophthalmology, 149;—Gee, S., Auscultation and percussion, 152; Medical lectures and aphorisms, 185;—Gilliam, D. T., A text-book of practical gynecology, 124;—Goepp, R. M., State Board questions and answers, 245;—Gordon, M. H., Abel's laboratory handbook of bacteriology, 183;—Gould, G. M., Borderland studies, ii, 283; Right-handedness and left-handedness, with chapters treating of the writing posture, the rule of the road, etc., 284;—Gowers, W. R., Lectures on the diseases of the nervous system. The borderland of epilepsy, 210;—Green's Encyclopedia and dictionary of medicine and surgery, 212;—Green, R. H., and Brooks, N., Diseases of the genito-urinary organs and the kidney, 122;—Guthrie, L. G., Functional nervous disorders in childhood, 52;—Ham, B. B., Report on plague in Queensland, 1900-1907, 209;—Hardaway, W. H., Cutaneous therapeutics, 23;—Hare, H. A., A text-book of practical diagnosis, 22;—Harris, Wilfred, Electrical treatment, 284;—Harvey, W. F., The theory and practice of anti-rabic immunization, 213;—Hassall, A., and Stiles, C. W., Index catalogue of medical and veterinary zoology, 283;—Hecker, R., and Trump, J., Atlas and epitome of diseases of children, 55;—Hirst, B. C., A text-book of obstetrics, 20;—Howell, W. H., A text-book of physiology for medical students, 21;—Hygienic Laboratory, Bulletin No. 40, United States Public Health and Marine Hospital Service, 1908, 246; Bulletin No. 41. Milk and its relation to the public health, 154;—International clinics, 1907, iv, 98; 1908, i, 184; ii, 284;—Johns Hopkins Hospital Nurses' Alumnæ Magazine, 118;—von Jurgenson, Th., Krehl, L., and von Schrotter, L., Diseases of the heart, 121;—Keen, W. W., Surgery: Its principles and practice, ii, 52; vol. iii, 124;—Kelly, H. A., Medical gynecology, 184;—Kelly, H. A., and Noble, C. P., Gynecology and abdominal surgery, 20;—Keogh, Sir A., and others, A manual of venereal diseases, 54;—Kerley, C. G., Treatment of the diseases of children, 54;—Kerr, Le G., Diagnostics of the diseases of children, 184;—Keyes, E. L., Syphilis, 151; Kieth, S., Cancer: Relief of pain and possible cure, 213;—Kirkes' Handbook of physiology, 210;—Laveran, H., and Mesnil, F., Trypanosomes and trypanosomiases, 54;—Leopold, G., A very young ovum in situ, 118;—Lockwood, C. B., Clinical lectures and addresses on surgery, 247;—Lusk, G., The elements of the science of nutrition, 99;—McCann, F. J., Cancer of the womb: its symptoms, diagnosis, prognosis and treatment, 374;—McIsaac, I., Preliminary nursing technique for first year pupil nurses, 152;—M'Vail, J. C., The prevention of infectious diseases, 51;—Miller, C. C., Cosmetic surgery. The correction of featural imperfections, 99;—Moore, N., The history of the study of medicine in the British Isles, 210;—Morris, M., and Dore, S. E., Light and X-ray treatment of skin diseases, 154;—Mortality statistics, 1906, 211;—Murray, R. W., Hernia: Its cause and treatment, 211;—von Noorden, C., Metabolism and practical medicine, 246;—Nutting, M. A., and Dock, L. L., A history of nursing, 97;—Ortner, N., Treatment of internal diseases for physicians and students, 183;—Osler, W., La pratique de la médecine, 123;—Osler, W., and McCrae, T., Modern medicine: Its theory and practice, iii, 53;—Ott, I., Text-book of physiology, 149;—Page, F. J. M., Elements of physics for medical students, 24;—Patton, W. S., The development of the Leishman-Donovan parasite in Cimex rotundatis, 212;—Pfoundler, M., and Schlossman, A., The diseases of children, 344;—Physician's visiting list for 1908, 23;—Poynton, F. I., Heart disease and thoracic aneurysm, 152;—Progressive medicine, vol. iv, 1907, 56; i, 1908, 154; ii, 1908, 246;—Putnam, J. J., A memoir of Dr. James Jackson, 53;—Reine-Maugeret, Cholécysto-Pancréatite, 373;—Robertson, W., Meat and food inspection, 348;—Rodman, W. L., Diseases of the breast with special reference to cancer, 182;—Rosenau, M. J., The thermal death points of pathogenic micro-organisms in milk, 209;—Sargent, P., Surgical emergencies, 119;—Schleip, K., Hematological atlas, with a description of the technic of blood examinations, 152;—Selter, P., An introduction to the study of the infant's stool, 119;—Sime, D., Rabies: Its place amongst germ diseases, and its origin in the animal kingdom, 96;—Simon, C. E., A manual of clinical diagnosis, 52; A text-book of physiological chemistry, 97;—Simpson, W. J., A treatise on plague, 98;—Sobotta, J., Atlas and text-book of human anatomy, 183;—Spencer, S., A practical guide to the examination of the ear, 184;—Stevens, A. A., A manual of the practice of medicine, prepared especially for students, 20;—Stiles, C. W., and Hassall, A., Index catalogue of medical and veterinary zoology, 283;—Strong, F. F., Essentials of modern electro-therapeutics, 100;—Sutherland, G. A., The treatment of disease in children, 97;—Tod, H., Diseases of the ear, 98;—Transactions of the National Association for the study of epilepsy and the care and treatment of epileptics, 348;—Treves, F., Surgical applied anatomy, 22;—Tyrode, M. V., Pharmacology, the action and uses of drugs, 283;—Thomson, A., and Miles, A., Manual of surgery, 212;—Thomson, H. C., Diseases of the nervous system, 347;—Thompson, R. L., Glimpses of medical Europe, 213;—Upson, H. S., Insomnia and nerve strain, 282;—Wachenheim, F. L., The climatic treatment of children, 98;—Naggett, E. B., Diseases of the nose, 246;—Wallace, G. S., and Dudgeon, L. S., Prostatic Enlargement. Bacteriology, 125;—Walton, G. W., Why worry? 247;—Washburn, M. F., The animal mind, 185;—Wells, H. G., Chemical pathology, 153;—Wells, D. W., Psychology applied to medicine, 153;—Wertheim, E., and Micholitsch, Th., The technique of vagino-peritoneal operations, 20;—White, W. A., Outlines of psychiatry, 155;—Wilcox, R. W., The treatment of disease, 53;—Williams, J. W., Obstetrics, 180;—Wood, C. A., Common diseases of the eye, 22;—Wrench, G. T., Rotunda midwifery for nurses, 185.

Obstetrical significance of the blood pressures and their relation to the work of the heart, 194.

Ophthalmovascular choke, 101.

Opie, E. L., The effect of injected leucocytes upon the development of a tuberculous lesion, 115.

Packard, Mrs., Further note on, 192.

Pancreatic ducts, changes in the, and their relation to chronic pancreatitis, 237.

Parathyroid, On the relation of the, to calcium metabolism and the nature of tetany, 91.

Parker, E. M., and Kerr, H. H., Intestinal anastomosis without open incisions by means of basting stitches, 132.

Pathological physiology, The teaching of. III. Organs of respiration, 215.

Pauli, W. O., Placental syphilis: A study of syphilitic placentæ with regard to the presence of the *Spirochæta pallida*, 326.

Peritonitis, tuberculous, The statistics of, from the clinical records of the Johns Hopkins Hospital, 256.

Phipps Institute, The methods of the, for the study, treatment, and prevention of tuberculosis in Philadelphia, 173.
Phipps Psychiatric Clinic in connection with the Johns Hopkins Hospital, 241.
Psychiaters and psychiatry of the Augustan era, 308.
Physiological pathology, The teaching of, at the University of Michigan, 336.
Pleurisy with effusion, Sudden death in, due to a change of position, 44.
Pneumonia, The contrast in the excretion of chlorine in influenzal pneumonia and in ordinary lobar, 367.
Pratt, J. P., and Thornton, W. L., The relation of bronchial stenosis to bronchiectasis, 230.
Proceedings of the Johns Hopkins Hospital Medical Society, 47, 92, 116, 145, 177, 203, 243;—Barker, L. F., Report of two cases of cerebrospinal meningitis treated by Flexner's meningitis serum, 94;—Bevan, A. D., Medical education in the United States, 203;—Bloodgood, J. C., Pathological-surgical specimens, 146;—Bordley, J., A family of hemeralopes, 93;—Crawford, A. C., The cause of the "loco" disease, 243;—Crowe, S., On the excretion of urotropin in the bile and pancreatic juice, 93;—Cullen, T. S., Gynecological cases, 146;—Cushing, H., Exhibition of cases, 92; Facial paralysis following otitis media, 148; The subtemporal decompressive operation for the relief of pressure symptoms due to fracture of base of skull, 48;—Dawson, P. M., Higgins, R. P., and Gorham, L. W., Studies on the circulation, 179;—Emerson, C. P., On the use of small doses of thyroid extract in the diagnosis of Basedow's disease, 47; Pancreatic disease, 95; The effect of pressure on the stethoscope on the intrathoracic sounds, 49;—Eyster, E., and Hooker, D. R., Effect of changes of blood pressure upon the pulse rate, 92;—Eyster, E. A., and Hooker, D. R., Studies on venous blood pressure, 244;—Finney, J. M. T., A case of gas-cyst of the intestine, 177;—Geraghty, J. T., The practical value of the demonstration of *Spirochæta pallida* in early syphilis, 94;—Gilchrist, T. C., A lantern slide demonstration of the hystopathology of experimental urticaria factitia, 49;—Hanes, F. M., Hereditary epistaxis associated with multiple telangiectases of the skin, nasal and buccal mucous membranes, 244;—Hooker, D. R., and Eyster, E., Effect of changes of blood pressure upon the pulse rate, 92;—Hooker, D. R, and Eyster, E. A., Studies on venous blood pressure, 244;—Howell, W. H., and Duke, W. W., A theory of vagus inhibition, 51;—Johnson, G. B., Splenectomy, with a report of six cases, 178;—Kelly, H. A., Anuria and nephrostomy by the ureter, 48;—Knower, H. McE., Demonstration of the interventricular muscle bands of the adult human heart, 208;—Lord, J. W., Exhibition of a case of ichthyosis hystrix, 243;—MacCallum, W. G., Pathological findings in a case of acute yellow atrophy of the liver, 50; Rupture of the wall of the heart and consequent hæmo-pericardium, 50;—MacCallum, W. G., and Voegtlin, C., Relation of tetany to calcium metabolism, 244;—McCarty, H. D., Enteritis with meningeal symptoms followed by multiple neuritis, 146;—McCrae, T., A study of the cases of pneumonia empyema occurring in the Johns Hopkins Hospital, 116;—Miller, R. T., Result of a pericardiotomy done on a boy seven year old, 116;—Randolph, R. L., Cataract operation in conjunction with nystagmus, 93;—Removal of steel from vitreous, 94;—Reik, H. O., Facial paralysis following otitis media, 147;—Retzer, R., The anatomy of the conductive system in the mammalian heart, 208;—Sladen, F. J., The results of the use of anti-meningitis serum (Flexner's) in the Johns Hopkins Hospital in 1908, 245;—Slemons, J. M., Eclampsia without convulsions, 48;—Stewart, H. A., Intraventricular systole, 207;—Strouse, S., A clinical study of the alkalinity of the blood, 117;—Thayer, W. S., Acute yellow atrophy of the liver, 50; The early diastolic heart sound (the so-called third heart sound), 206;—Thomas, H. M., Combined organic and hysterical paralysis, 145;—Voegtlin, C., The chemical analysis in a case of acute yellow atrophy of the liver, 50;—Voegtlin, C., and MacCallum, W. G., Relation of tetany to calcium metabolism, 244;—Williams, J. W., Exhibition of cases, 92.
Ptosis, A simplification of De Grandmont's operation for, 331.
Pulmonary complications following anæsthesia, 89.
Respiration, Organs of. The teaching of pathological physiology. III, 215.
Robin, A., John Syng Dorsey: The secret of his success, 127.
Roosevelt, Theodore, Letter on the International Congress on Tuberculosis, 187.
Rosenheim, S., The tonsillar ring and the paranasal sinuses as portals of entry of infectious diseases, 338.
Rous, F. P., The teaching of physiological pathology at the University of Michigan, 336.
Rowntree, L. G., The contrast in the excretion of chlorine in influenza pneumonia and in ordinary lobar pneumonia, 367.
Ruhräh, J., Thomas Muffet, 1553-1604, 312.
Sarcoma, Three cases illustrating the relationship between, and certain diseases of the blood, 332.
Schaudinn, Fritz. A review of his work, 169.
Schultz, O. T., Fritz Schaudinn. A review of his work, 169.
Sellards, A. W., The effect of heated serum on rouleaux formation of red-blood corpuscles, 271; The hæmolytic action of bile and its inhibition by blood-serum, 268.
Sigmoid kidney, A case of, 229.
Skinner, J. O., Major James Carroll, M. D., U. S. A., 11.
Slemons, J. M., and Goldsborough, F. C., The obstetrical significance of the blood pressures and their relation to the work of the heart, 194.
Smirnow, M. R., and Cole, R. I., The pro-infective ("aggressive") action of normal blood-serum, 249.
Stavely, A. L., Acute and chronic gastro-mesenteric ileus, with cure in a chronic case by duodeno-jejunostomy, 252.
Steiner, W. R., Dr. Elisha North, one of Connecticut's most eminent medical practitioners, 301.
Sternberg, G. M., Major James Carroll, M. D., U. S. A., 8.
Strouse, S., A clinical study of the alkalinity of the blood, 137.
Summaries or titles of papers by members of the Hospital or Medical School staff appearing elsewhere than in the Bulletin: Amberg, S., The opsonic contents of the blood of infants, 56;—Auer, J., Gastric peristalsis in rabbits under normal and some experimental conditions, 56;—Auer, J., and Meltzer, S. J., Ueber einen Vagusreflex für den Oesophagus, 56; Reflexhemmung der Kardia vom Vagus aus, 56;—Baer, W. S., Some observations on the use of oil in the mobilization of joints, 56; Some operations on the spinal column, 56;—Baetjer, F. H., The use of the X-ray in the diagnosis of renal and urethral calculi, 56;—Barker, L. F., Joint affections in nervous disease, 56; On the psychic treatment of some of the functional neuroses, 56; The psychic side of medicine, 56; The psychic treatment of nervous disorders, 56; The diagnosis of exophthalmic goitre, 56; Neurological and psychiatric diagnosis, 56;—Barker, L. F., and Sladen, F. J., On acrocyanosis chronica anæsthetica with gangrene; its relation to other diseases, especially to erythromelalgia and Raynaud's disease, 56;—Beall, K. H., The paravertebral triangle of dulness in subphrenic abscess (Grocco's sign), 56;—Block, E. Bates, Address of the retiring President, 56;—Bloodgood, J. C., Chapter on Surgical shock, 56; Intestinal obstruction, 56; Surgery. Clinical review of the year's literature, 56; Surgery of the extremities, fractures, dislocations, tumors, surgery of joints, shock, anæsthesia, and infections, 56; Acute dilation of the stomach, 56;—Blumer, G., *Spirochæte pallida* in syphilis, 56; Little biographies: Vieussens, 56; A note on Lionel Wafer, surgeon and buccaneer, and his description of the Isthmus of America, 56;—Boggs, T. R., Chapter on Infectious diseases of doubtful nature, 56; Wright's "throttled capillary"

adapted to the control of blood-counting pipettes, 57;—Bordley, J., Treatment of trachoma, 57;—Brödel, M., How may our present methods of medical illustration be improved? 57;—Brown, T. R., Chapter on The mechanics of respiration and of the respiratory tract, 57; Review in medicine, 57;—Bunting, C. H., Experimental anæmia, 57; —Calvert, W. J., Pericarditis with effusion, 57; Pulsus paradoxus in pericarditis with effusion, 57; Chapter on Plague, 57; Esbach's albumin test complicated by kreatinin, 57; Traube's semilunar space in empyema, 57; The posterior median pleural boundary with reference to Grocco's sign, 57; Camac, C. N. B., Some of the recent important contributions to our knowledge of heart disease, 57;—Camac, C. N. B., and Schoenberg, A., A case of melano-sarcoma of the eye (primary) and of the liver (secondary), 57;—Churchman, J. W., Paraurethritis, 57; Treatment of bacteriuria by internal medication, 57; Post-traumatic atrophy of the testicle, 57;—Churchman, J. W., and Buerger, L., The cœliac and mensenteric plexuses and their role in abdominal shock, 57;—Churchman, J. W., and Osler, W., Chapter on Syphilis, 57;—Churchman, J. W., and Young, H. H., The possibility of avoiding confusion by *B. smegmatis* in the diagnosis of urinary and genital tuberculosis, 57;—Clark, T. W., and Garrod, A. E., A new case of alkaptonuria, 57;—Clarke, T. W., and Huntley, W. H., On sulph-hæmoglobin, 57;—Clarke, T. W., and West, S., Idiopathic cyanosis due to sulph-hæmoglobinæmia, 57;—Cohoe, B. A., The finer structures of the glandula sub-maxillaris of the rabbit, 57;—Cole, Rufus I., The vaccine treatment of infectious diseases, 57; Chapter on Gonococcus infections, 57; The opsonic theory and the treatment of infections by vaccines, 57;—Cook, H. W., Cardiovascular regulation during and after operation, 57;—Cullen, T. S., A series of interesting gynecologic and obstetric cases, 57; Parasitic uterine myomata, 57; Surgery of the liver, 57;—Cushing, H., Some further modifications in the Gasserian ganglion operation for trigeminal neuralgia (sensory root evulsion), 57; Remarks on the surgical treatment of facial paralysis and of trigeminal neuralgia, 57; Chapter on Surgery of the head, 57; A discussion of some intermediate and some remote consequences of cranial injuries, based on three clinical histories which illustrate the extradural, subcortical and intermeningeal types of intracranial hæmorrhages, 57;—Davis, J. S., A case of cicatricial contraction following burn, with relief by Wolfe graft, 57;—Dunton, W. R., The dispensary treatment of neurasthenia, 58; The new anti-narcotic law from the standpoint of the physician, 58;—Erlanger, J., and Blackman, J. R., A study of the relative rythmicity and conductivity in various regions of the auricles of the mammalian heart, 58;—Fabyan, M., and Thayer, W. S., The paravertebral triangle of dulness in pleural effusion (Grocco's sign), 58; Studies on arteriosclerosis with especial reference to the radial artery, 58;—Farrar, Clarence B., The embryonic pia, 58; Clinical demonstration. IV. Melancholia vera, 58;—Finney, J. M. T., Rhinoplasty by means of one of the fingers, 58;—Finney, J. M. T., and Friedenwald, J., The report of an unusual case of ulcer of the stomach, 58;—Flexner, S., Enzymotic properties of *Diplococcus intracellularis*, 58; Direct silver staining of spirochætes and flagellated bacteria, 58; Experimental cerebrospinal meningitis, 58; Experimentelle Cerebrospinal Meningitis und ihre Behandlung, 58; Contributions to the biology of *Diplococcus intracellularis*, 58; Experimental cerebrospinal meningitis in monkeys, 58; Concerning a serum therapy for experimental infection with *Diplococcus intracellularis*, 58; *Spirochæta* (Treponema) *pallida* and syphilis, 58;—Flexner, S., and Jobling, J., Remarks on and exhibition of a metastasising sarcoma of a rat, 58; On secondary transplantation of a sarcoma of the rat, 58; On the promoting influence of heated tumor emulsions on tumor growth, 58; Restraint and promotion of tumor growth, 58; Infiltrating and metastasising sarcoma of the rat, 58;—Ford, W. W., On the presence of hemolytic substances in edible fungi, 58; Antibodies to glucosides, with especial reference to rhus toxicodendron, 58;—Futcher, T. B., Chapter on Diabetes mellitus, 58; Diabetes insipidus, 58; Gout, 58;—Geraghty, J. T., and Young, H. H., The treatment of stricture of the urethra. Based on a study of 400 cases and a review of the literature, 58; Chronic prostatitis. An experimental and clinical study, with an analysis of 358 cases, 58;—Giffin, H. Z., Mayo, W. J., and Wilson, L. B., Clinical aspect of acquired diverticulitis of the large bowels, 58;—Gilchrist, T. C., An interesting group of cases of tuberculous infections of the skin and one allied case, 58;—Halsted, W. S., The results of radical operations for the cure of carcinoma of the breast, 58; Hypothyreosis, status parathyreoprivus and transplantation of the parathyroid glands, 58; Opening of discussion on exophthalmic goitre at meeting of American Medical Association, June, 1907, 58;—Halsted, W. S., and Evans, H. M., The parathyroid glandules. Their blood supply and their preservation in operation upon the thyroid glands, 58;—Harris, N. MacL., The relative importance of streptococci and leucocytes in milk, 58;—Hoch, A., A report of two cases of general paralysis with focal symptoms, 59; The psychogenic factors in the development of psychosis, 59;—Holden, G. R., The indications for operation in elective surgery, 59; Dysmenorrhœa as a symptom of abnormal pelvic conditions, 59; The diagnosis of extrauterine pregnancy, 59;—Howard, Campbell P., Myxœdema: A study, 59; Serum sickness and serum death: a compilation of some recent literature, 59;—Hunner, G. L., Chapter on diseases of the bladder and urethra, 59; Gonorrhœa in women; some of its unusual features, 59; The tub-bath treatment of cystitis, 59;—Hunt, R., The probable demonstration of thyroid secretion in the blood of exopthalmic goitre, 59; The relation of iodine to the thyroid gland, 59; Isopral and chloral hydrate. Comments on the communication by Dr. Impens, 59;—Jacobs, H. B., Maryland's onward march. Great strides made in providing agencies for preventing and curing tuberculosis, 59;—Kelly, H. A., Walter Reed and yellow fever, 59; Byron Robinson and his work, 59; The lesson of little things. The conquest of yellow fever, 59; Surgical treatment of tuberculosis of the kidney, 59; The protection of the innocent, 59; Bi-manual vibratory palpation, 59; A gynecological clinic: the report of a case of stricture of the ureter, due to a stone, causing severe attacks of colicky pain and finally demanding operative interference—the removal of the kidney, 59;—Kelly, H. H., and Noble, C. P., Gynecology and abdominal surgery, 59;—Knox, J. H. M., Jr., and Schorer, E. S., A study of hospital and dispensary milk in warm weather with special reference to Pasteurization, 59;—Little, H. M., Puerperal infection. Certain clinical considerations, 59;—Lynch, F. W., Hour of birth. A discussion as to the hour at which birth most often occurs, 59;—MacCallum, W. G., Hypertrophy of islands of Langerhans in diabetes, 59; The pathology of exophthalmic goitre, 59; Chapter on Pathology of Tuberculosis, 59; Pathological anatomy of lymphosarcoma and its status with relation to Hodgkin's disease, 59;—MacCallum, W. G., and Thayer, W. S., Experimental studies of cardiac murmurs, 59;—McCrae, T., Arthritis deformans, 59; Chapter on Typhoid Fever, 59; Chapter on The pathology of typhoid fever, 59; Chapter on The symptoms of typhoid fever, 59; Chapter on The diagnosis and prognosis of typhoid fever, 59; Chapter on The prophylaxis and treatment of typhoid fever, 59; Chapter on Typhus Fever, 59; Chapter on Relapsing Fever, 59;—Madison, J. D., The symptoms and diagnosis of acute intestinal obstruction, 59;—Marshall, H. T., The recent trend of immunity research, 59;—Marshall, H. T., and Musgrove, W. E., Gangosa in the Philippine Islands, 60; —Meyer, A. W., The lymphatic glands in pregnancy, 60;—Mitchell, J. F., Local anæsthesia in general surgery, 60;—Opie, E. L., Experimental pleurisy: resolution of a fibrinous exudate,

60; The transformation of serofibrinous into purulent pleurisy, 60; Opsonins of inflammatory exudates, 60; Opsonins and their relation to diagnosis and treatment of bacterial infection, 60;—Opie, E. L., and Baker, B. I., Leucoprotease and antileucoprotease of mammals and of birds, 60;—Osler, W., The evolution of internal medicine, 60; The Royal Medical Society of Edinburgh: Particularly its relations with the professions of the United States and Canada. Remarks at the dinner of the Royal Medical Society, Feb. 2, 1907, 60; Cerebrospinal fever, 60; Abdominal tumors connected with disease of the testicle, 60; On multiple hereditary telangiectasis with recurring hæmorrhages, 60; Discussion on the diagnosis of acute pancreatitis, 60; Osler, W., and Churchman, J. W., Chapter on Syphilis, 60;—Reed, J. V., Theory of opsonins and vaccines, 60; Reik, H. O., The symptomatology and diagnosis of laryngitis consecutive to purulent otitis media, 60; When shall we advise tympanomastoid exenteration in the treatment of suppurative otitis media, and in what percentage of cases may we expect a cure, 60; Is eye strain an etiologic factor in epilepsy? 60; The pathology of middle ear suppuration, 60;—Riggs, T. F., Woyazanska (tuberculosis), 60; Cheiloplasty for ectropion of the lower lip, 60;—Robb, H., Bladder and bowel fistulæ following an abdominal section with report of case, 60; Abdominal section during pregnancy for ovarian tumor (dermoid) with a twisted pedicle, with report of case, 60; The immediate results of conservative operative measures on the tubes and ovaries, 60; Ectopic gestation, with special reference to the treatment of tubal rupture, 60; The comparative advantages of catgut and silver wire sutures for closing the fascia after abdominal incisions, 60;—Rous, F. P., Clinical studies of the cerebrospinal fluid, with especial reference to pressure, protein content, and the number and the character of the cells, 60; A method for the simultaneous passage of many paraffin sections through the more difficult stains, 60; A preliminary report of the effects of struggle on the content in white cells of the lymph, 60; The clinical examination of the cerebrospinal fluid, 60;—Sampson, J. A., Studies in gynecology: presented in the form of illustrated problems for classroom work, 60; Conditions resulting from injuries to the pelvic floor and their prophylaxis, 60; Sampson, J. A., The relation of ovarian cysts to abdominal and pelvic pain, 60; The renal catheter as an aid in the diagnosis of valve-like obstruction of the ureter, 60;—Simon, C. E., A manual of clinical diagnosis, 60; A text-book of physiological chemistry, 60; Leukemic blood picture in a case of fracture of the ankle, 60; The percentage index versus the bacillary index in the estimation of the opsonins, 61; Meningococcus septicæmia, 61; A further contribution to the knowledge of the opsonins, 61;—Sladen, F. J., and Barker, L. F., On acrocyanosis chronica anæsthetica with gangrene; its relations to other forms of cyanosis, especially to erythromelalgia and Raynaud's disease, 61;—Slemons, J. M., and Williams, J. Whitridge, The toxæmias of pregnancy, 61;—Spratt, C. N., Report of a case of leptomeningitis with onset of symptoms sixteen days after a radical operation, the infection reaching the meninges along the facial nerve, 61;—Strong, R. P., Chapter on Amœbic Dysentery, 61;—Thayer, W. S., On the importance of the simpler physical and psychical methods of treatment, 61; Observations on the teaching of clinical medicine, 61;—Thayer, W. S., and Fabyan, M., The paravertebral angle of dulness in pleural effusion (Grocco's sign), 61; Studies on arterio sclerosis with especial reference to the radial artery, 61;—Thayer, W. S., and Hazen, H. H., Calcification of the breast following a typhoid abscess, 61;—Thayer, W. S., and MacCallum, W. G., Experimental studies of cardiac murmurs, 61; Theobald, S., Indications for the employment of adrenalin chlorid, in conjunction with cocain, in operations on the eye, 61; A conservative treatment of chronic suppuration of the middle ear, 61;—Thomas, H. M., and Greenbaum, H. S., Multiple neuritis (non-diphtheritic) in children, 61;—Tinker, M., Prevention of adhesions after abdominal operations, 61; Gall-duct obstruction caused by movable kidney, 61; Local anæsthesia for major and minor operations: Factors influencing success, 61; The surgical treatment of goitre, 61;—Vanderhoof, D., The value of blood examination in diagnosis, 61; The diagnosis and treatment of malarial fever, 61;—Walker, G., Complete suprapubic prostatectomy under nitrous oxide gas anæsthesia, 61; Primary ligation of the vas deferens and its accompanying vessels before manipulating the testicle during its removal for tuberculosis or malignant growth, 61; Walker, G., Simple ulcer of the bladder, 61; A new urethroscope to be used with the aid of water distension, 61; A new evacuator for use after litholapaxy, 61; Occlusion of the portal vein due to surrounding inflammatory adhesions, 61; Tuberculosis of the bladder, 61; A new combined lithotrite with cystoscope, 61;—Walker, G., and Fisher, W. A., Eight cases of suprapubic prostatectomy: Complete relief of symptoms and perfect functioning of the bladder, 61;—Warfield, L. M., Tuberculin as a diagnostic agent in incipient pulmonary tuberculosis, 61;—Watts, S., Urethral diverticula in the male with report of a case, 61; The suture of blood vessels. Implantation and transplantation of vessels and organs. An historical and experimental study, 61;—Welch, W. H., The relation of the hospital to medical education and research, 61; The benefits of the endowment of medical research, 61;—Werckmeister, E., Zur Casuistik des durchborenden Geschwürs and Divertikels im Duodenum, 62; Unblutige Behandlung von Mastdarmstricturen, 62; Zur Kehlkopfexstirpation wegen Carcinom, 62; Eine Fistelkanule und ihre Verwandbarkeit, 62;—Williams, J. W., Obstetrics, 62; Toxæmic vomiting of pregnancy, 62;—Williams, J. W., and Slemons, J. M., The toxæmias of pregnancy, 62;—Woolley, P. G., Subcutaneous fibro-granulomata in cattle, 62; Veronal dermatitis, 62; Climatic bubœs, 62; Some tropical cutaneous ulcerative conditions, 62; The bacteriotherapy of leprosy, 62;—Yates, J. L., The pathological basis for a rational curative treatment, of malignant disease of the breast, 62;—Young, H. H., The seven-glass test. Presentation of a chart showing the differential diagnosis of inflammatory lesions of the urethra, prostate, seminal vesicles, and bladder, 62; The use of ointments in the urethra in the treatment of chronic urethritis, 62; The treatment of impermeable stricture of the urethra, 62; The use of the cystoscope in the diagnosis of diseases of the prostate, 62; A modern method for the performance of perineal lithotomy, 62; The operative treatment of vesical diverticula with report of four cases, 62; A case of double renal pelvis and bifid ureter. Catheterization of the healthy branch. Erroneous diagnosis, Death after operation, 62; A description of the Dispensary devoted to the treatment of genito-urinary surgical cases at the Johns Hopkins Hospital, 62; The treatment of prostatic hypertrophy by conservative perineal prostatectomy. An analysis of cases and results based on a detailed report of 145 cases, 62; Recto-urethral fistulæ. Description of new procedures for their prevention and cure, 62; The early diagnosis and radical cure of carcinoma of the prostate. Being a study of 40 cases and presentation of a radical operation which was carried out in four cases, and an appendix, compiled later, containing the complete histories of 64 cases, 62; The cure of unilateral hematuria by injection of adrenalin through a ureteral catheter, 62;—Young, H. H., and Churchman, J. W., The possibility of avoiding confusion by *B. smegmatis* (the smegma bacillus) in the diagnosis of urinary and genital tuberculosis, 62;—Young, H. H., and Geraghty, J. T., The treatment of stricture of the urethra. Based on a study of 400 cases and a review of the literature, 62;—Young, H. H., and Geraghty, J. T., and Stevens, A. R., Chronic prostatitis. An experimental and clinical study with an analysis of 358 cases, 62;—Young, H. H., and Lehr, L. C., Pyonephrosis due to *Bacillus typhosus*. A report of two cases, and three cases found in the literature, 62.

Syphilis, placental. A study of syphilitic placentæ with regard to the presence of the *Spirochæta pallida*, 326.
Syphilis, The practical value of the demonstration of *Spirochæta pallida* in the early diagnosis of, 364.
Thayer, W. S., Major James Carroll, M. D., U. S. A., 7.
Theobald, S., A simplification of De Grandmont's operation for ptosis, 331.
Thornton, W. L., and Pratt, J. P., The relation of bronchial stenosis to bronchiectasis, 230.
Tonsil, A method for the complete enucleation of the, 328.
Tonsillar ring (The) and the paranasal sinuses as portals of entry in infectious diseases, 338.
Tuberculosis in Philadelphia, The methods of the Henry Phipps Institute for the study, treatment, and prevention of, 173.
Tuberculosis of the stomach; tuberculous cavities of the liver; with report of a case, 223.
Tuberculosis, Letter from President Roosevelt on the International Congress on, 187.
Tuberculosis problem, A comprehensive plan for the treatment of the, 349.
Tuberculous lesion, The effect of injected leucocytes upon the development of a, 115.
Typhoid sera, Amboceptors and complement in, 263.
Venous pressure in man, An instrument for the determination of, 274.
Ventricles, The volume curve of the, in experimental mitral stenosis, and its relation to physical signs, 319.
Voegtlin, C., and MacCallum, W. G., On the relation of the parathyroid to calcium metabolism and the nature of tetany, 92.
Walsh, J., The methods of the Henry Phipps Institute for the study, treatment, and prevention of tuberculosis in Philadelphia, 173.
Welch, W. H., Major James Carroll, M. D., U. S. A., 6; Some of the conditions which have influenced the development of American medicine, especially during the last century, 33.
West, J. M., A method for complete enucleation of the tonsil, 328.
Wight, O. B., Pulmonary complications following anæsthesia, 89.
Winternitz, M. C., A case of sigmoid kidney, 229; Changes in the pancreatic ducts, and their relation to chronic pancreatitis, 237; Tuberculosis of the stomach; tuberculous cavities of the liver; with report of a case, 223.

ILLUSTRATIONS.

Sudden death in pleurisy with effusion due to a change of position (Figs. 1-2), 46.
A satisfactory pressure bandage for the leg (Plates I-II, Figs. 1-14), 114.
John Syng Dorsey (Plates III-IV, Figs. 1-7), 130.
Intestinal anastomosis without open incisions by means of basting stitches (Plate V, Figs. 1-8), 136.
Clinical study of the alkalinity of the blood (Chart I), 138; (Charts 2-10), 141-142.
Cardiohepatic angle (Figs. 1-2), 144.
Avicenna, 159.
Pathological physiology of organs of respiration (Plates VI-VII, Curves 1-4), 216.
Right meso-jejunal hernia (Plate VIII), 220.
Abnormalities of the pulmonary blood vessels, 222.
A case of sigmoid kidney, 229.
The relation of bronchial stenosis to bronchiectasis (Fig. 1), 230; (Plate IX, Figs. 2 and 4), 230; (Fig. 3), 231.
Newly formed lymphatic vessels in malignant growths (Figs. 1-2), 234.
Changes in the pancreatic ducts (Plates X-XI, Figs. 1-10), 240-241.
The pistol pipette (Fig. 1), 263.
Amboceptors and complement in typhoid sera (Figs. 2-11), 264-268.
An instrument for the determination of venous pressure in man (Fig. 1), 275.
A family of hemeralopes (Plate XII, Figs. 1-6), 280.
Sir John Harington, 285.
The Harington engraving of Queen Elizabeth, 286.
Working plan of Harington's water closet, 291.
The school of Montpellier (Plates XIII-XV, Figs. 1-15), 300-301.
Dr. Elisha North, 303.
The volume curve of the ventricles in experimental mitral stenosis (Plate XVI, Figs. 1-5), 320; (Fig. 6), 321.
Auricular fibrillation (Plates XVII-XVIII, Figs. 1-6), 324-325.
Micro-photograph of *Spirochæta pallida* in fœtal liver tissue, 326.
Knives and forceps used in tonsil enucleation, 329.
Complete tonsil enucleation (Plate XIX, Figs. 1-6), 330.

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